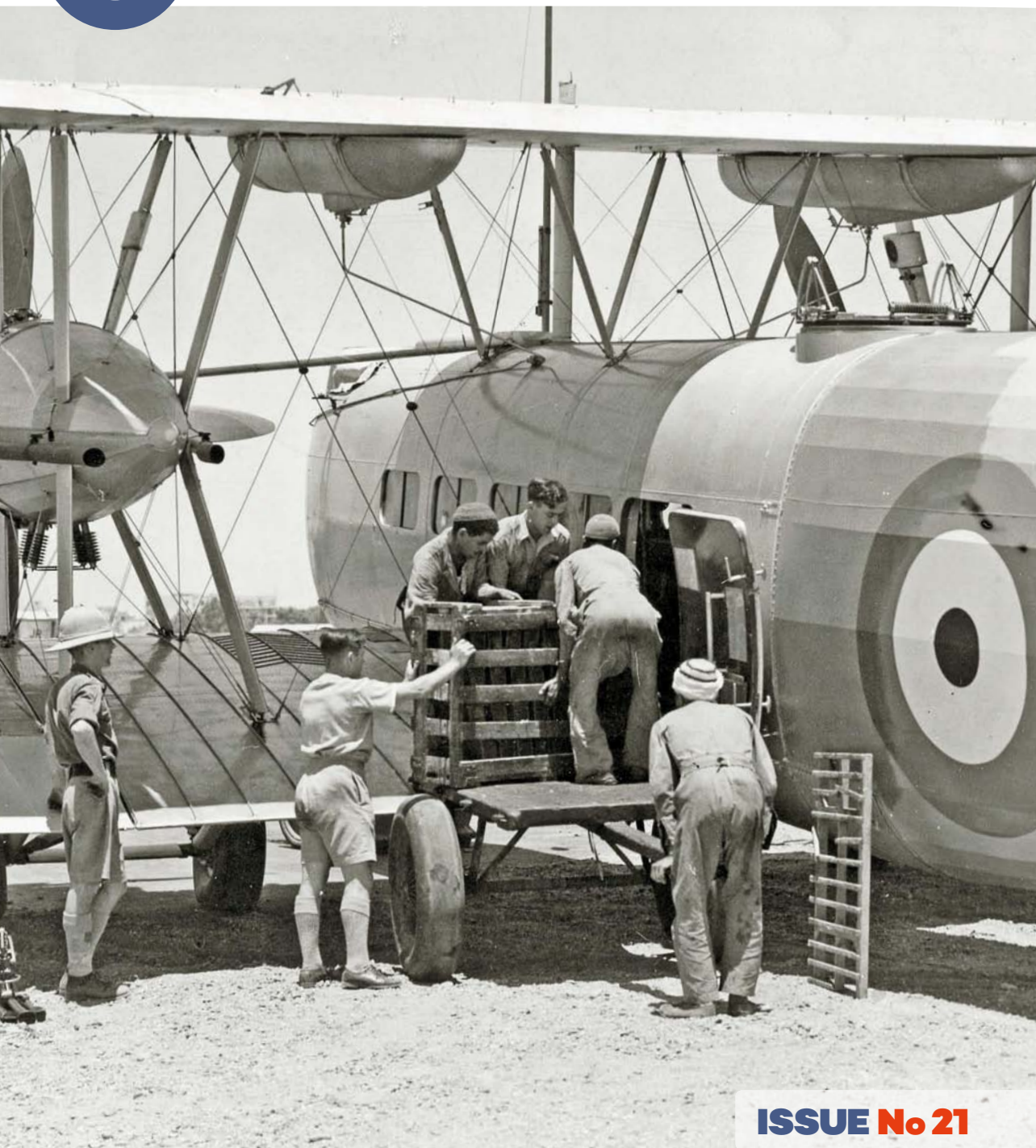


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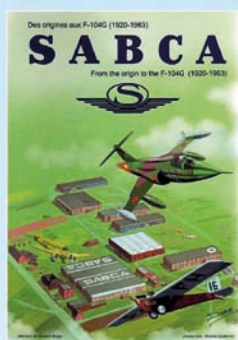
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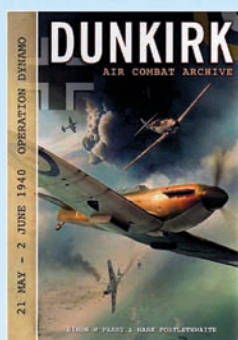
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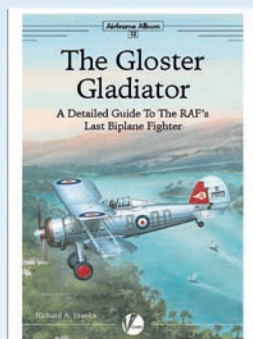
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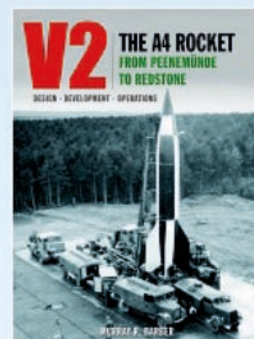
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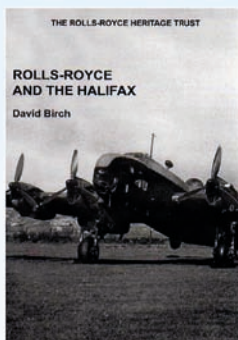
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EDITOR

Nick Stroud
e-mail nickstroud@theaviationhistorian.com

MANAGING EDITOR

Mick Oakey
e-mail mickoakey@theaviationhistorian.com

PRODUCTION MANAGER

Amanda Stroud

FINANCE MANAGER

Lynn Oakey

For all telephone enquiries:
tel +44 (0)7572 237737 (mobile number)

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The modern journal of classic aeroplanes and the history of flying

Editor's Letter

"IN THE GLORIOUS sunshine we found ourselves flying over rolling pasture lands broken only by ranges of small hills, and I am positive I saw two black lions . . ." Thus inter-war RAF pilot Richard Shaw describes just one of the many adventures he had during a (then) routine but (now) extraordinary 6,000-mile round trip from the northern tip of Africa to its southernmost state in 1934. Exotic flights around the big continent were a regular occurrence for the RAF then, and the late Gp Capt Shaw's diary of a memorable trip from Cairo to Pretoria in a Vickers Victoria gives us a wonderful flavour of the times, from bathing in a freshwater pool in the shadow of Kilimanjaro to circling through the mist rising from the majestic Victoria Falls at Livingstone. I am greatly indebted to Gp Capt Shaw's daughter, Jilly McLaren, and her husband Ian, for giving us the opportunity to share this beautifully written memoir, which offers lyrical evidence of why the RAF enjoyed a much-envied reputation at the time as "the greatest flying club in the world".

Since Iran's bloody revolution in 1979, very little of the country's aviation history has filtered through to the West; author Babak Taghvaei is making great strides in changing that, and his second feature for *TAH* details the history of the Imperial Iranian Air Force's Golden Crown formation aerobatic display team, several members of which went on to be executed by the new regime — a tragic and ill-deserved end for some of the nation's finest airmen.

We also round off our 60th anniversary coverage of the 1957 Defence White Paper with Chris Gibson's look at its aftermath. It's a subject with far-reaching implications for what the UK learned from it and what it would do next — something we will be returning to in the very near future. Watch this space!

FRONT COVER A typically vivid Charles E. Brown photo of a Vickers Victoria loading up at Heliopolis in the 1930s; see Richard Shaw's memoir of flying the type in Africa (page 80). PHILIP JARRETT COLLECTION

BACK COVER An F-4C Phantom II of the 366th TFW, as used in Operation Bolo (page 60), awaits another mission at Da Nang. USAF

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In 1934 the late Richard Shaw, then a Flying Officer with No 216 Sqn RAF, kept a diary of the unit's adventurous flight from Cairo to Pretoria in South Africa. We present extracts from it, along with some of his superb photographs

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AIR CORRESPONDENCE



Letters to the Editor

The joy of Junkers

SIR — I have just been reading *TAH* issues 17 and 19; what joy! There are several items of particular interest.

The Editor's account of John Stroud's flight in BEA's Jupiter-Class Junkers Ju 52/3m G-AHOF from Croydon to Belfast in March 1947 (*To Belfast by Jupiter, TAH17*) was of prime interest because my dad, E.J. Riding, took a similar trip in company with historian A.J. Jackson a few days earlier, on February 21. They too flew with Capt Moynihan but in BEA Junkers Ju 52/3m G-AHOG, the first of the ten Jupiter-Class Ju 52s to enter service with the Scottish Division of BEA. Instead of flying direct from Croydon to Nutts Corner, a stop was made at Speke, Liverpool, the flights taking 1hr 25min and 1hr 15min respectively. This once-daily service began on November 18, 1946, departing Croydon at

0945hr, arriving Speke 1130hr, departing at 1155hr to arrive at Belfast at 1325hr. The reciprocal service departed Belfast at 0900hr, arrived at Speke at 1030hr, and departed at 1055hr to arrive Croydon at 1240hr.

On my dad's flight the 12-seater G-AHOG departed snow-laden Croydon at 0950hr and flew blind at 2,000ft on a course of 340°, cruising at 130 m.p.h. They began letting down between Nantwich and Frodsham and landed at Speke in 2–3 miles visibility at 1115hr. At 1205hr G-AHOG took off and encountered 10/10ths cloud and snow all the way to Nutts Corner, passing Ronaldsway, Isle of Man, at 1247hr before landing at 1330hr. My dad returned the following day in Daks G-AIOF and G-AGZF.

Short Bros' conversion of the Ju 52s was considered by the aviation press at the time to be extremely good. One fact not mentioned in the

Looking ahead to next year . . .

WITH 2018 FAST approaching, it's time to begin planning for the new year — so here is a choice of aviation calendars to provide aid and adornment. The two larger ones (20in x 14in) are the famous GHOSTS calendars created by veteran air-to-air photographer Philip Makanna; they feature various World War One and World War Two subjects respectively. Order them for \$14.99 + p&p apiece from www.ghosts.com or GHOSTS, 665 Arkansas Street, San Francisco, CA

94107, USA. The smaller one (8¼in x 11¼in) is the Cross & Cockade International calendar, featuring paintings of World War One subjects by 12 different artists. It is yours for £11 inc p&p (UK), £12.50 Europe and £13.50 RoW, from www.crossandcockade.com or by post from Cross & Cockade International, Hamilton House, Church Street, Wadenhoe, Peterborough PE8 5ST. Profits from this once again support the upkeep of the British Air Services Memorial at St Omer.



Stroud account was G-AHOF's interior colour scheme. Can you believe: pinkish walls, cream ceiling, brown carpet, blue seats and grey curtains? Another passenger on the same flight as John noted that the light switch in the lavatory still said "Ein" and "Aus"!

The Ju 52/3ms were equipped with MF/DF, Standard Beam Approach and VHF/RT in addition to normal communications equipment. Painted silver overall, the Jupiter-Class

Ju 52/3ms sported BEA red cheat lines.

Junkers 52/3m.g8e G-AHOG was previously VM979 and, like G-AHOF, was one of 60 or so Ju 52s impressed after capture and held by the Enemy Aircraft Storage & Servicing Unit at Hamburg/Fuhlsbüttel for possible future use as transports. It was sold in February 1946 and after conversion and furnishing by Short Bros & Harland Ltd at Belfast it received a Certificate of Airworthiness in November 1946.

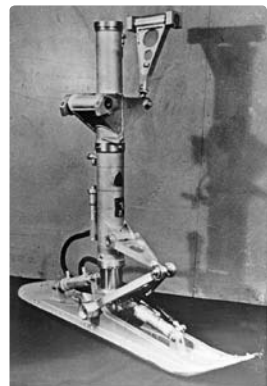


Richard Riding sent these photographs to accompany his letter on these pages about Junkers Ju 52/3m G-AHOG. CLOCKWISE FROM ABOVE: Capt Moynihan and crew at Croydon on February 21, 1947 — the BEA "Jupiters" normally carried a crew of four: Captain, First Officer, Radio Operator and Steward/Stewardess; the starboard engine nacelle (with its own fuel gauge) and wing seen from E.J. Riding's seat; passengers boarding G-AHOG at Croydon on the morning of February 21 (a freezing A.J. Jackson is seen at right); the aircraft at Speke, Liverpool, on the same day.



E.J. RIDING PHOTOGRAPHS





FURTHER DETAILS OF the ski-equipped French Vampire (Lost & Found, TAH15) have come from Jean-Christophe Altherr in France, who writes: "The history you seek is to be found on pages 145–146 of the Numéro spécial Trait d'Union 1980: D.H.100 Vampire et SE.535 Mistral en France. The undercarriage was designed and built by the DOP company to enable the Mistral to take off and land on unprepared strips. The ski itself, shown ABOVE RIGHT, was mounted on Mistral prototype No 02; it was ground-tested in December 1954 and flight-tested the following January. While the test results were satisfactory on a grass field, the ski appeared to be unsuitable for a hard surface — impeding, for example, movement of the aircraft inside a hangar. DOP then designed a special trolley equipped with two small wheels, seen ABOVE. After the Mistral had landed using the skis, the trolleys were simply put in front of the aircraft (after it had been chocked), and the pilot gently moved forward to place the skis on the trolleys. All in all, however, the system was considered too complex for operations. During the first quarter of 1956 another Mistral, No 61, was equipped with the skis and tested by the Centre d'Expériences Aériennes Militaires between March 1956 and February 1957. The absence of any markings in your picture suggests it shows the Mistral prototype."

After the aircraft was withdrawn from BEA service in the late summer of 1947, G-AHOG's ownership reverted to the Ministry of Civil Aviation, to which it had originally been registered on May 21, 1946. It was flown from Renfrew to Ringway where it languished until scrapped by the British Aluminium Company Ltd at its Latchford works at Warrington in February 1948.

Moving on to *TAH19*, I was very interested in the piece on the Lockheed SR-71 (*Giant Reach: The Blackbird in East Anglia*). I was at Mildenhall on the occasion of that penultimate flight out and took about 15min of video of McCleary and Gudmundson, preparing for the flight, taxiing the -71 out of the open-ended barn all the while dripping fuel from every orifice until it started moving, the thundering take-off and two fly-bys; all very impressive. By the time I had motored back home I think the SR-71 had already arrived at its USA destination!

The other thing I remember about that afternoon at Mildenhall is an armed "female" Military Policeperson who threatened to shoot anyone who dared to cross the red line adjacent to the barn!

So for me there was plenty of interest in both editions of *TAH*. Well done for your continuing high standard; every issue is a joy to peruse.

Richard T. Riding Radlett, Hertfordshire

Back to front

SIR — Congratulations on another splendid issue. As an old "Hawker man", I was fascinated by Philip Jarrett's *Hornet/Norn* piece, *The Hornet Dilemma*, in *TAH19*.

Please advise him that Bert Hayward (whom I knew well at Dunsfold) is definitely second from *right* in the photograph on page 80 [and **BELOW**].

I suggest that Bulman's caption may somehow have got transposed since 1931!

Ambrose Barber Petersfield, Hampshire



Outstanding officers

SIR — I enjoyed Santiago Rivas's article *Blue On Blue* in *TAH19*, on the 1955 revolutionary activity in Argentina involving Gloster Meteors. Very well done, and with excellent supporting images.

On page 88, in his description of the attack on the *ARA Cervantes* and *ARA La Rioja*, he may not have been aware that, as incredible as it might seem now, there were intelligence reports at the time in both the USA and Britain suggesting that at least two of the four Meteors attacking these ships were flown by former Luftwaffe pilots!

By March 1956 this had been thoroughly rebuffed, but it was the subject of truly wild speculation at the time. Apparently that first attack on the two surface vessels was accompanied by a solitary IAé-24 Calquin, piloted by Capt Julio César Cáceres.

The crews of the Meteors that attacked the naval vessels were described by the US Assistant Air Attaché at the time, Lt-Col Lowell E. May, as "very excellent pilots and outstanding officers", but he lamented the fact that they all were apparently facing immediate discharge from the service "within a very short time" as a result of their participation in the revolt. Besides *Vicecomodoro* Sísiter, the other Meteor pilots were apparently *Vicecomodoro* Angel Orlando Perez Laborda, *Capitán*s Raul Ernesto Lopez, Jorge Raul Quagliardi and *Primer Teniente* Ernesto Jorge Andradás. Three other Meteor pilots, based at Morón (and who then flew to Rio Cuarto, where they serviced their aircraft and then made the attack on Córdoba), were *Comandantes* Eduardo Catala, Daniel Pedro Aubone and Capt Guillermo Lucio Bernardez Dominguez.

Dan Hagedorn Maple Valley, WA, USA

Alias the Aardvark

SIR — What a great idea of Brian Cope's (*Air Correspondence*, *TAH20*, in response to Chris Gibson's excellent article *Swing-wing London?*, *TAH17*) that the RAF should have called the General Dynamics F-111 the Liberator 2; even I, as a great fan of the Consolidated B-24 Liberator, never thought of that!

However, since Australia was moving in "lock step" with the USA at this time, the fact that the F-111 was the only aircraft in USAF history not to be given a name (officially) while in service, was telling on the Air Board over here.

Various names were considered for the aircraft in Australian service: Annihilator, Destroyer and Falcon, as well as at least 18 Aboriginal names for weapons. The fact that a little later a failed attempt to name the Bell 206 Kiowa helicopter in Australian Army service as the "Kalkadoon" is an indication that it was a good idea that the latter was not attempted; fortunately, Kiowa it remained.

It seems extremely unlikely that in late 1966 (when naming was considered) that there would have been anyone on the Air Board who could have drawn the connection between General Dynamics and Consolidated/Consolidated-Vultee down to the Liberator.

The aircraft was unofficially named Aardvark by the USAF ("earth pig" in Afrikaans), which was more colloquially rendered in Australia simply as "the Pig"; this was reportedly because it "had a long snout, rummaged in the dirt and was active at night". Aardvark became the official USAF name for the aircraft after retirement in 1996.

Bob Livingstone Samford, Qld, Australia



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60 YEARS ON Duncan Sandys
& the 1957 Defence White Paper

SHRINKING PAINS

THE AFTERMATH

Continuing our series marking the 60th anniversary of Duncan Sandys' infamous 1957 Defence White Paper, Cold War specialist **CHRIS GIBSON** examines some of the fall-out of the Paper in its immediate aftermath, including the need for a strategic transport/freighter and the "under-the-counter" development of English Electric's promising P.22 interceptor

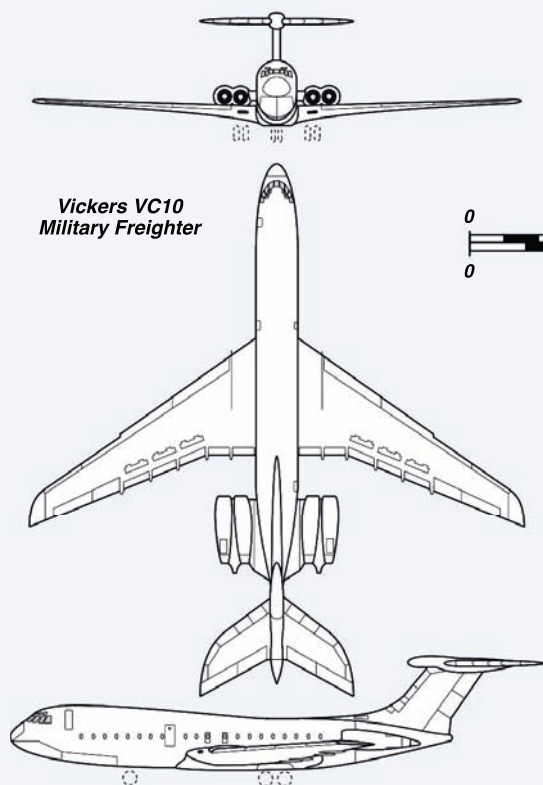
WHEN ANALYSING the 1957 Defence White Paper, most accounts dwell on the perceived downside of cancelled aircraft projects and the rise of the guided weapon, while few examine other aspects of Defence Minister Duncan Sandys' notorious paper. Harold Macmillan, and it must be remembered that Macmillan was by January 1957 the Prime Minister and therefore the driving force behind all government policies, handed Sandys the task of reorganising the armed forces full in the knowledge that he would fulfil it. Before January, Macmillan had been Eden's Chancellor of the Exchequer and before that, Churchill's Defence Secretary, and understood that costs had to be cut. Arguably, Sandys was more henchman than archvillain.

Sandys' brief was to cut the cost of defence, modernise the services' equipment, free up industrial capacity and therefore boost the economy. So far, so well-known, but few aviation historians examine the effects on the other armed services, with the Royal Navy and British Army taking cuts as well. National Service ended and there was an overall loss of manpower in the British armed forces of some 375,000 personnel,

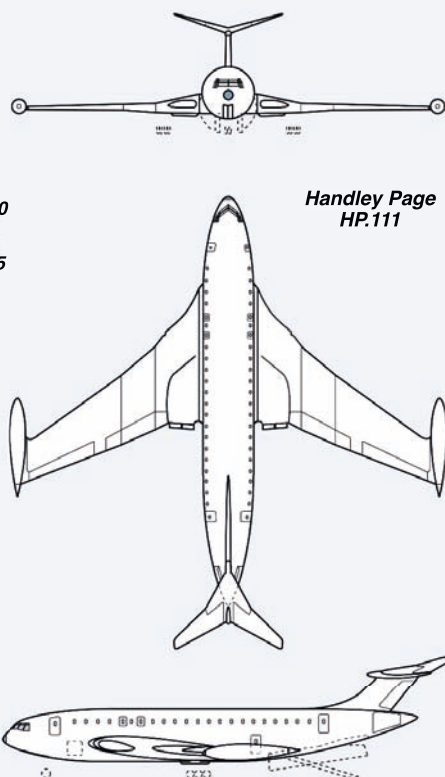


Despite the 1957 Defence White Paper calling for reduced spending on defence, the threat of a nuclear strike by the Soviet Union was no more diminished than before its publication. How best to deal with that threat continued to vex the Air Staff, especially with the advent of nuclear-armed ballistic missiles. Here, three high-ranking RAF officers assess the threat board (linked to the Ballistic Missile Early Warning System at RAF Fylingdales), at Bomber Command HQ at RAF High Wycombe in the early 1960s. RAF AIR HISTORICAL BRANCH





**Vickers VC10
Military Freighter**



**Handley Page
HP.111**

almost half of the establishment. Recruitment would henceforth be on a volunteer basis, but if one volunteer is worth ten pressed men, volunteers come with costs, and a two-year tour in the Far East without family was not conducive to recruitment. Therefore, personnel would need to be moved back and forth between the Far East and the UK, preferably by air. The plus side of such a commitment was that, should the balloon go up, the means would be in place to reinforce rapidly. The General Staff had drawn up a requirement for an infantry brigade to be moved to Singapore in seven days.

THE TRANSPORT ISSUE

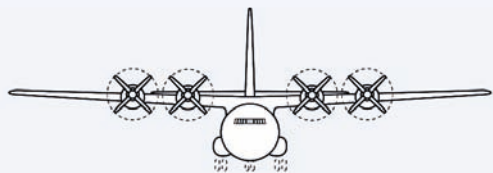
From this grew the requirement for trooping flights on a larger scale than before, and with a "surge capability" and the possibility of "family trooping", Sandys' plan needed transport aircraft to replace the available ageing Avro Tudors and Canadair Argonauts. This had been in hand before 1957 with the Vickers V.1000 (see *The Blame Game* by Prof Keith Hayward in *TAH 14*), but its cancellation led to the acquisition of the Bristol Britannia and, later, Vickers VC10.

Modernising the Services' equipment also came at a price, not just the new guided weapons and associated radars, but their requirement for updates and regular servicing. This posed a

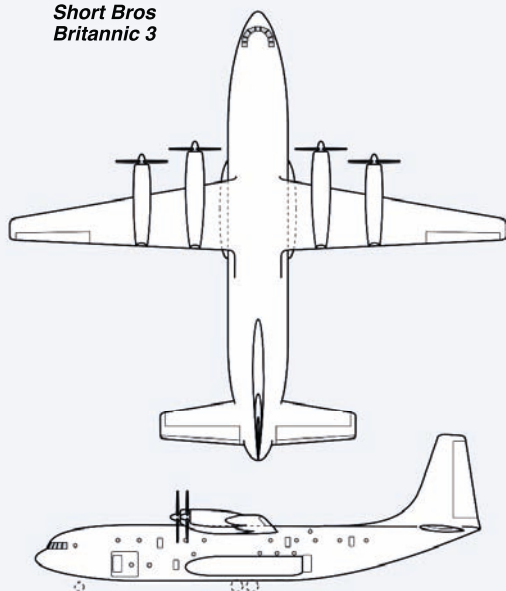
problem for the UK armed forces because in 1957 Britain still had a considerable presence "East of Suez". Despite moves towards withdrawal from Empire, the UK still had treaty obligations in the Middle and Far East which required a presence to act as a "fire brigade" should events take a turn away from HM Government's interests.

The perennial answer was to stockpile the kit and fly in personnel as and when required, but this presented two problems in the post-Sandys world. The first was that the new high-tech kit was too expensive to stockpile and, secondly, the equipment needed regular servicing and updates. There was also the possibility of it falling into the hands of the forces they were to be used against.

To identify the transport needs of British forces, a committee was established under the chairmanship of Admiral Sir Alexander Bingley. An admiral? Advising on aircraft for the RAF and Army? Whatever next? Bingley was Fifth Sea Lord, responsible for all aspects of aviation in the Royal Navy. Bingley confirmed the need for a trooping type, which emerged as the Britannia and later VC10. Moving an infantry brigade and particularly its equipment, however, was beyond the payload/range capability of RAF Transport Command's beloved Beverley, so a new strategic freighter was needed.



**Short Bros
Britannic 3**



Before Eden's ill-fated Suez venture in October 1956, British forces could use the "CENTO route". This took RAF aircraft and contracted civilian troop flights across the territories of the Central Treaty Organisation (CENTO) that comprised Iran, Iraq, Pakistan, Turkey and the UK. Post-Suez, there was a possibility of overflight rights being withdrawn and so alternative routings to the south, over central and southern Africa and even around the Cape, would need to be considered.

The Air Staff was faced with several choices for this, but eventually it boiled down to the VC10 Military Freighter, Handley Page HP.111 or Short Bros Britannic 3. From the off, the Air Staff wanted the thoroughly modern, jet-powered, high-speed, capacious HP.111; or if that was off the menu, the VC10 Military Freighter. The last thing the Air Staff wanted parked on its ramps was a Short product, as the company's work to date on the Seamew anti-submarine aircraft and the Britannic had not inspired confidence. Nor was a propeller-driven Britannic what the Air Staff wanted, with Air Marshal Sir Geoffrey Tuttle regarding an order for the Britannic as comparable with "the War Office ordering horses at this time". However, the Strategic Transport programme became something of a political football, with the Air Staff, War Office,



ABOVE Admiral Sir Alexander Bingley, head of the Military Transport Committee, had commanded aircraft carriers HMS Slinger and Biter during the Second World War. After the war he was appointed Deputy Director of Air Warfare, becoming Fifth Sea Lord in 1954, after a two-year spell commanding HMS Eagle.

LEFT The three main contenders for the post-Sandys military strategic freighter/transport role. Ultimately, the Short Britannic 3 was chosen and entered service as the Belfast. Artwork by CHRIS GIBSON © 2017

Air Ministry and Ministry of Aviation all vying to get what they wanted. Added to this was the "Northern Ireland Question". Her Majesty's Government owned 72 per cent of Short Bros, and, since the company was one of the largest employers in Belfast, the government view was that Short should be kept in business.

Suffice to say, whichever company was granted the Strategic Transport contract, much of the work, such as fuselage construction, would have to be done in Belfast. The Air Staff took a dim view of all this and wondered what delays would arise from shipping HP.111 or VC10 fuselages from Radlett or Weybridge, or their wings to Belfast. In the end, Short Bros was granted a contract for ten SC.5 Britannic 3A strategic transports, the type entering RAF service in 1966 as the Belfast C.1.

"UNDER THE COUNTER"

Sandys and his 1957 Defence White Paper certainly laid the foundations for an effective air defence of the UK — but not in the manner he intended. Having cancelled the "ultimate interceptor" designed to requirement F.155/OR.329, there was nothing in the development pipeline apart from the English Electric P.1B Lightning. Long-range surface-to-air guided weapons (SAGW) would defend the UK from



TAH ARCHIVE

Soviet bombers in years to come and interceptors were declared obsolete (see Greg Baughen's *A Brief History of the Future*, TAH20). However, there was an underground movement that saw a need for a different type of interceptor.

The only game in fast-jet town was OR.339, calling for a long-range under-the-radar strike/reconnaissance aircraft that would ultimately lead to the BAC TSR.2. For this requirement, English Electric at Warton had drawn up the P.17A, a sleek shoulder-winged tailed delta with a weapons bay that incorporated a rotary bomb-bay door. The P.17A offered high performance and long range in the strike role, but these were also applicable to a long-range interceptor. Sandys had proscribed any development work on fighters apart from the Lightning, which survived by being too far down the line and the SAGWs not being sufficiently developed.

As the ultimate interceptor, OR.329/F.155 had been intended to react fast, climb hard and intercept incoming Soviet bombers before they came close enough to launch stand-off weapons. The designers at Warton, innovative as ever, considered this to be folly and drew on the lessons learned from Exercise *Hermes*. This exercise had shown that an attack supported by heavy electronic jamming or using "powered bombs" could not be countered by the scramble tactics upon which F.155 was based. The key to dealing with such attacks was to have standing patrols with aircraft that could loiter at subsonic speeds, but then quickly react to deal with the jamming aircraft, or destroy those carrying stand-off weapons.

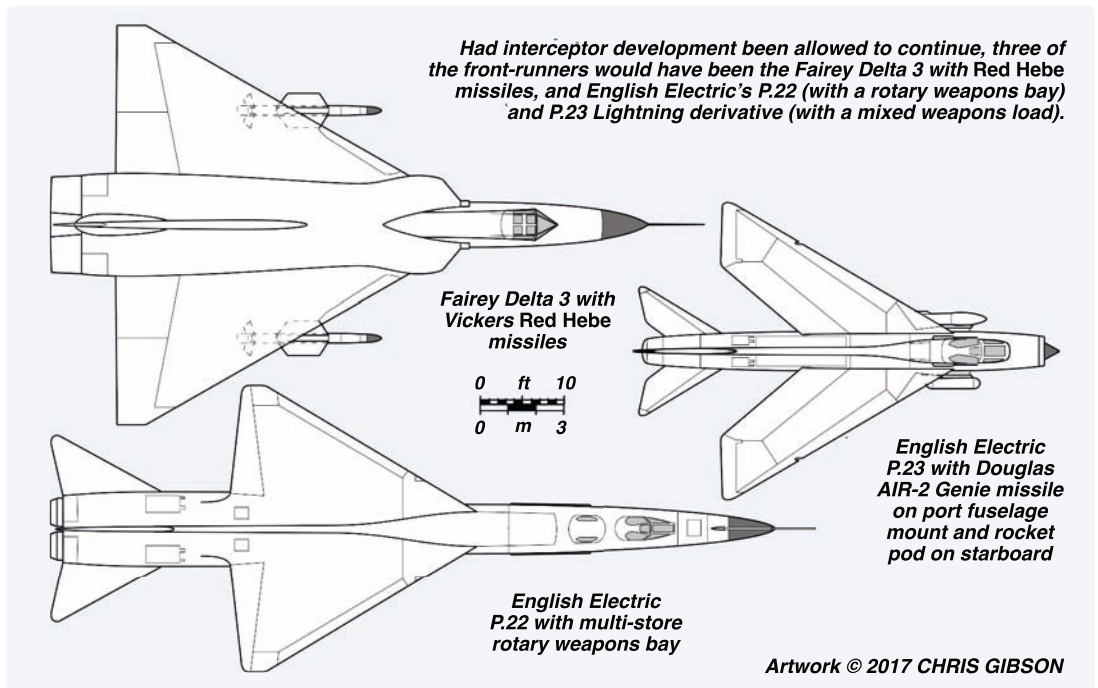
ABOVE The Short Bros Britannic 3 (the Air Staff's least favourite choice for the strategic freighter/transport role) was developed into the Rolls-Royce Tyne-powered Belfast, which made its first flight on January 5, 1964. The type, of which only ten were built, entered RAF service in January 1966, this example, XR364, named Pallus, joining No 53 Sqn that year.

For this the P.17A fitted the bill, able to match the scramble interception performance of the Lightning and the Fairey Delta 3, the type selected for F.155. However, that was with a fuel load of 1,000 Imp gal (4,545lit) but if the P.17A's full tankage of 4,286 Imp gal (19,485lit) was used, the type became far more flexible and ideally suited for the role envisaged in Exercise *Hermes*.

THE BRAINS OF THE OPERATION

The P.17A was a tactical strike aircraft fitted with a forward-looking collision-avoidance radar, a sideways-looking radar and strike cameras, so there was plenty of room in the airframe for the airborne interception (AI) radar and datalink needed for an interceptor. English Electric's experience with the Lightning and its Ferranti AI.23/AIRPASS (Airborne Interception Radar & Pilot Attack Sight System) placed Warton and Ferranti in a good position to produce a system suitable for a long-endurance fighter with a longer-ranged targeting system to use against Soviet aircraft carrying stand-off bombs.

Ferranti produced a report, IFC/DMM/71, covering the work required to increase the locating-range of the AI.23 radar. The P.17A's collision-avoidance radar and the AI.23 were interchangeable and, as an alternative, GEC's



AI.18 radar could be installed in the same space. By increasing the diameter of the antenna from 24in (61cm) to 36in (91cm) and narrowing the beam width, the radar's range capability against a Canberra-sized target would increase from 12 miles (22km) to 25 miles (46km). By changing the radar from X-band to J-band the range would be further increased, with the benefit of improved jamming resistance — but this change would take at least three years to develop.

As a quicker solution, a continuous-wave (CW) variant of GEC's AI.18 was considered as an alternative and was in development with government sponsorship. This variant would also be countermeasure-resistant, but could be further modified to provide illumination for semi-active air-to-air missiles (AAMs) such as *Radar Red Top* (a modified *Red Top* with a Matra AD-26 X-band seeker) or Sparrow III.

The same systems used for air interception could also be fitted with an S-band receiver to home in on Soviet aircraft jamming the ground radars used for early warning and fighter control. English Electric noted that a second crewmember dedicated to operating the system increased the effective range of the radar and improvements in range could be achieved by increasing the size of the radar display.

English Electric's proposal for a modified P.17A interceptor variant, the P.22, was put forward at a time when guns were being removed from most interceptors, with Warton's own Lightning F.2 lacking the twin 30mm Aden cannon of the earlier F.1. The twin-Rolls-Royce Medway-powered P.22 was to carry all its ordnance

internally, mounted on a rotary bomb-bay door, thus removing the drag that would have plagued the F.155 interceptors, particularly if Vickers' 16ft (4.9m)-long *Red Hebe* missile had been carried on wing pylons. Not that the Lightning was free of draggy weapons, with its two de Havilland Firestreaks or a Douglas Genie/rocket pod combination on forward fuselage-mounted "crates".

The P.22 was to carry the new *Blue Jay Mk 4*, soon be renamed *Red Top*, mounted on the rotary bomb door. Owing to the 3ft (0.9m) span of the missile's main wings, the *Red Tops* were staggered fore and aft to ease stowage within the bay. To launch these weapons, the P.22's weapons bay door would rotate to expose the weapons, which were then lowered on a trapeze mechanism to increase clearance from the aircraft. Interestingly, later in the development of the collision-course *Red Top*, Sandys was in favour of cancelling it and keeping the pursuit-course Firestreak as the Lightning's main weapon pending the deployment of the Bristol Bloodhound Mk 2 surface-to-air missile (SAM) with CW radar guidance and improved ramjets. So much for Sandys being a missile-lover.

It was this possibility — having no collision-course weapon — that led to the Air Staff's interest in the Genie. The Douglas AIR-2 Genie was a rocket with an American W25 nuclear warhead, triggered by a basic time fuze set by the pilot. It was intended to arm the Lightning series, and Warton conducted a design study under the designation P.23. This study investigated the use and carriage of the Genie

on the Lightning and, after trying overwing, wingtip, ventral semi-recessed and underwing carriage, found that the same crate used for the Firestreak was best. The P.23 benefited from work done for the P.22, as the earlier study had concluded that there was no point in the Lightning carrying two Genies, because the target might not merit, or the interception “solution” be safe enough, to use a nuclear warhead. Therefore, a secondary armament should be used, and, since the Lightning F.2 and the P.22 lacked internal guns, some other weapon should be carried.

This was the Microcell 2in (5cm)-diameter unguided rocket. The standard rocket pod held 37 rockets, so the Lightning could carry a Genie on the port pylon and a rocket pod on the starboard. Of course, the rockets were a collision-course weapon, aimed with a gunsight, if such equipment was fitted. The P.22 could carry much more, up to ten pods, but could carry a mixed load of two Genies and two pods or two *Red Tops* and two pods. Thanks to the launch rails being on a trapeze, the rockets on the forward stores stations could be fired without affecting those on the aft. This was particularly important with the Genie, as the efflux from its Thiokol SR49-TC-1 rocket motor was highly corrosive.

A DIFFERENT KIND OF INTERCEPTOR

The P.22, with its varied weapons load and long-range radar, differed substantially from the established thinking on interceptors — i.e. early warning, scramble, climb, destroy the target and return to base — of which the Lightning and the designs to OR.329/F.155 were prime examples. The P.22 was aimed at a different mission profile, with the aircraft patrolling out towards any incoming enemy aircraft. The P.17A's capacious internal tankage gave the P.22 a 5hr endurance on a patrol line that was far enough away to destroy the bombers before stand-off missiles were launched. This might be the reason the P.22 was effectively hidden — it conflicted with the Stage 1¾ and Stage 2 SAGWs intended to destroy bombers at ranges of up to 200 miles (320km), which was 100 miles (160km) less than the maximum detection range of the ground-based radars. Of course, if the ground radars were being jammed by Soviet electronic warfare platforms, the S-band homer on the P.22 could be critical to their continuing operation.

So, the P.22 would have possessed the capability of using state-of-the-art weapons systems and could have carried later radar-guided weapons such as *Radar Red Top* and the AIM-7 Sparrow III. These would require cutting-edge radar systems and these were on the drawing boards. How would the P.22 have

compared with the SAGWs being developed for a post-Sandys air defence? The Bloodhound Mk 1 to meet Stage 1 was in service in 1958 but, with a range of only 25 miles (40km), was useful only as a defence for the V-bomber bases against aircraft carrying freefall bombs; but it did give the RAF experience of operating guided weapons. The real area air-defence systems were *Blue Envoy* to Stage 1¾ and the Stage 2 SAGWs. *Blue Envoy*, with a range of 150 miles (240km), continuous-wave guidance, mid-course update, nuclear warhead and Mach 3 performance, would have been a formidable weapon.

Stage 2 was just not feasible as it called for a range of 200 miles (322km) which was the maximum detection range of the UK's early-warning radars. When the scale of the development programme was realised, the USA's Boeing IM-99 BOMARC was proposed, but was met with scepticism as its pulsed-radar guidance was deemed susceptible to jamming. There was also the small matter of its 250-mile (400km) range, which from bases in south-east England would cover northern France. As one senior member of the Air Staff stated, “We're not defending the bloody French!”

By 1964 the thinking behind Sandys' Defence White Paper was being reassessed. The world had changed since 1957, with flexible response replacing the tripwire nuclear strategy, and Britain's withdrawal from Empire bringing about a more Europe/North Atlantic-focused defence policy. Professor R.V. Jones, head of the 1964 Working Party on Air Defence, had investigated the air defence of Great Britain, and the long-endurance interceptor plus Bloodhound Mk 2 were to form the main air defence of the UK. But it would be 20 years before the Warton design team's ideas saw the light of day with the Tornado Air Defence Variant (ADV). Perhaps the P.22 had been *too* well hidden.

The P.22 was hidden away for half a century, one of those “under the counter” programmes undertaken in the design offices of Britain's aviation companies. Perhaps, had the P.22 been shown to Sandys, its capability of operating at long-range and for long periods might have appealed to his way of thinking. The P.22 would certainly have found approval with the Jones Committee that ultimately led to the Tornado ADV.

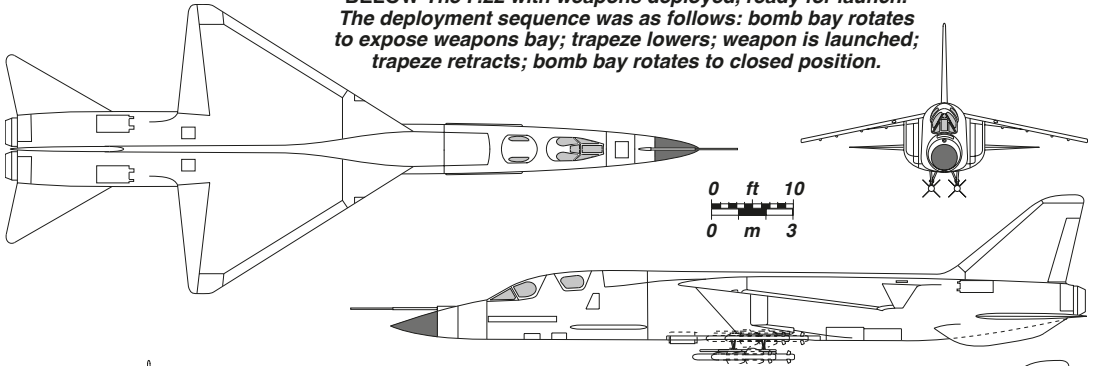


COMING SOON Using declassified official brochures, Tony Buttler investigates “Hawker's TSR.2” — the P.1129, designed to OR.339.

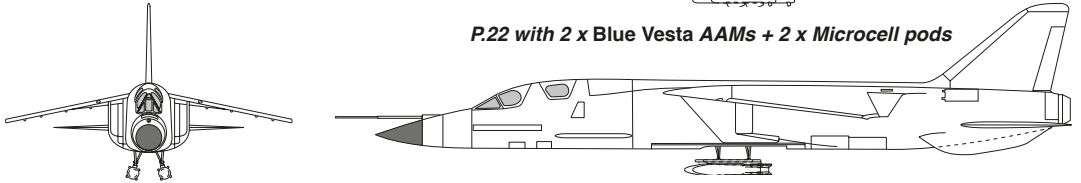
ACKNOWLEDGMENTS *The author would like to thank Damien Burke, Terry Panopalis and Tony Wilson for their invaluable help during the preparation of this article.*

ENGLISH ELECTRIC P22 WEAPONS LOAD

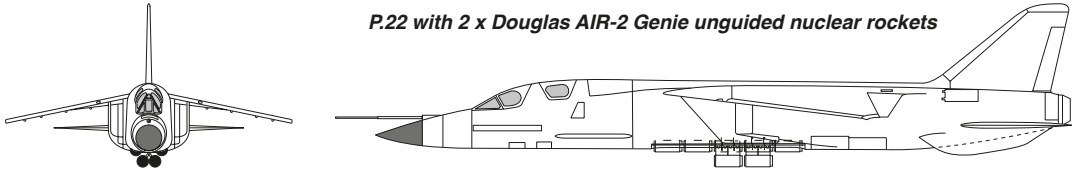
BELOW The P.22 with weapons deployed, ready for launch. The deployment sequence was as follows: bomb bay rotates to expose weapons bay; trapeze lowers; weapon is launched; trapeze retracts; bomb bay rotates to closed position.



P.22 with 2 x Blue Vesta AAMs + 2 x Microcell pods

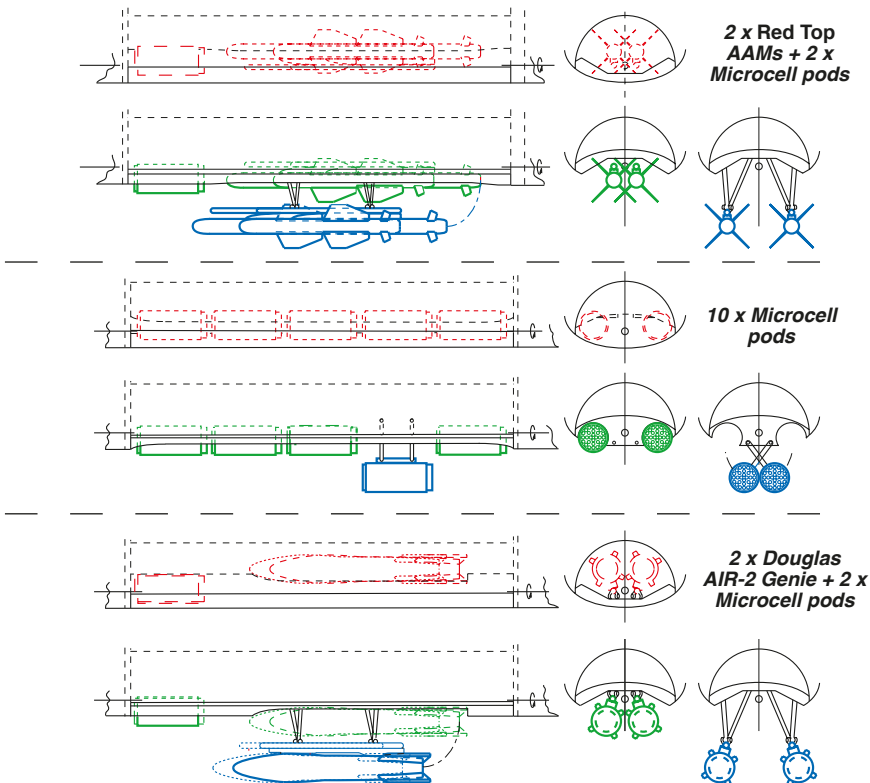


P.22 with 2 x Douglas AIR-2 Genie unguided nuclear rockets



Artwork © 2017 CHRIS GIBSON

P.22 with 10 x Microcell pods with up to 370 x 2in (5cm) unguided rockets



LEFT & BELOW Rotatable bomb-bay sequence with various weapons loads.

■ Weapons bay closed, weapons stored

■ Weapons bay open, weapons exposed

■ Weapons bay open, weapons ready to fire

The rotary bomb bay proposed for the P.22 was based on a design invented and trademarked by the Glenn L. Martin company in the USA, which used the idea on its experimental three-engined bomber/ground-attack aircraft, the XB-51, although the type was never put into production.

FLAG OF CONVENIENCE

With war curtailing the Armstrong Whitworth Ensign's career as an Empire-route airliner, the type was put into camouflage and sent to Africa and the Middle East to operate with BOAC as a general transport. It has long been thought that at least one of them was captured by the Germans, re-engined and put back into service. The facts say otherwise, explains **PHILIPPE RICCO**



DESIGNED TO A 1934 Imperial Airways Ltd (IAL) specification for a large land-plane airliner for the company's European and Eastern routes, the Armstrong Whitworth A.W.27 Ensign made its first flight on January 24, 1938. In total, 14 examples were built, the type entering IAL service on the Croydon—Paris route on October 20 the same year. The last two examples, ordered by IAL on December 15, 1936, were completed as Ensign Mk IIs, the new designation denoting the replacement of the type's original Armstrong Siddeley Tiger engines with Wright GR-1820 Cyclones, deemed more reliable, driving Hamilton 23E50 107 propellers.

Construction of the two Ensign Mk IIs had slowed considerably after a decision to explore their potential as lower components of a "piggyback" Short Mayo-style arrangement in 1938, work on the pair picking up again only in

1940. As a result, the first Mk II, G-AFZU, named *Everest*, did not make its maiden flight until June 20, 1941, followed by G-AFZV, named *Enterprise*, on October 28 the same year.

Two Ensigns were lost during the Battle of France in the spring of 1940. The first, G-ADSZ, named *Elysian*, was destroyed on the ground on May 23 at Merville in northern France by Messerschmitt Bf 109s. The second, G-ADSX *Ettrick*, was severely damaged on June 1 during a bombing raid on Le Bourget, where it was abandoned. A third Ensign was lost in the UK, when G-ADTC *Endymion* was destroyed during a German air raid on Bristol's Whitchurch airport on November 24 the same year.

The remaining Ensign Mk Is were upgraded to Mk II standard, as a result of which the type was considered suitable for BOAC operations in the Middle East, and particularly on the vital supply

BELOW Bearing Air France's distinctive winged seahorse logo on the forward fuselage ahead of the company's legend, as well as its name in French service, Nouakchott, on the nose, Ensign Mk II F-BAHD (not F-BAHO as stated in some sources) is prepared for another flight at Agadir, Morocco, in 1942, before its withdrawal to France.

ALL IMAGES VIA AUTHOR



Recently discovered photographs taken by German soldiers in 1940 prove conclusively that neither G-ADSZ Elysian, seen below at Merville after being on the sharp end of a Messerschmitt Bf 109 strafing attack, nor G-ADSX Ettrick, the severed tail of which is seen BELOW at Le Bourget, was repaired and returned to the air, despite at least one respected source asserting that Ettrick was fitted with Daimler-Benz engines and flown again.



route between the West African ports and Egypt, which became known as the “Takoradi Route”, after the port in the British Gold Coast colony (now Ghana).

TO AFRICA

The first Ensign to leave the UK for service on the route was G-AFZU, which departed Portreath in Cornwall for Lisbon on November 9, 1941, only to be attacked by a Heinkel He 111 while crossing the Bay of Biscay. Badly damaged, the Ensign was lucky to make it back to the UK, where it was repaired and delivered on its second attempt.

The second of the Ensign Mk IIs, and the last of the type to be built, G-AFZV (c/n AW.1822) was delivered to BOAC on October 30, 1941, two days after its maiden flight. In late January 1942 it was flown by Capt W.B. Houston from RAF Bramcote in Warwickshire to Portreath to position for its flight to West Africa. Houston was again at the controls when the Ensign departed Portreath on February 1, equipped with two additional fuel tanks on the cabin floor, containing a total of 1,010gal (4,590lit), bringing the total fuel capacity to 2,074gal (9,430lit).

In the late afternoon the Ensign arrived at Gibraltar, from where it departed at 0318hr on February 3, bound for Takoradi via Bathurst (now Banjul) in British Gambia (now The Gambia) and Freetown in Sierra Leone. Everything was proceeding well until about 1215hr when the port inner engine began leaking oil off the coast of Mauritania, nearly 300 miles (480km) from Bathurst. Houston throttled the engine back and feathered the propeller. Soon after, the port outer engine began to show similar symptoms, and, when the starboard inner also began to run rough, the captain decided to descend to 1,000ft (300m) and approach the coast of French West Africa (now Mauritania and Senegal), preferring the option of dry land rather than the sea.



With the aircraft sinking at about 100ft/min (30m/min), Houston made a belly landing on the first available stretch of desert, relaying his position (18°30'N, 16°2'W) by radio as being in the dunes a few miles from Nouakchott, the Mauritanian capital, and about a mile from the beach. The crew abandoned the aircraft and a Short Sunderland of No 204 Sqn, flown by Flt Lt E.M. Ennis, was despatched to rescue them from the beach.

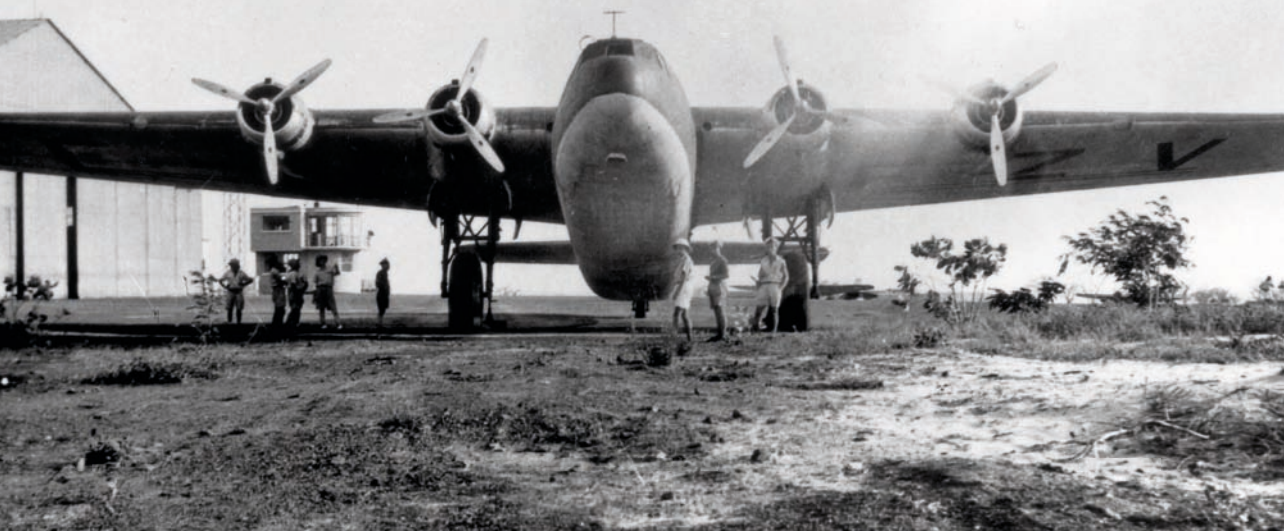
A French patrol found the Ensign in good condition on February 12, and a party was sent out to try to put it back on its undercarriage. A pit was dug in the sand beneath each inner engine nacelle (into which the mainwheels retracted), allowing the undercarriage to drop and lock. The aircraft was then removed by means of two sloping trenches dug forward of the pits, after which it was dragged to the beach and towed



ABOVE Enterprise following its belly landing in the dunes near Nouakchott, the Mauritanian capital, in February 1942. The type's high wing was certainly an advantage, the damage to the wing and Wright Cyclone engines being kept to a minimum. The crew made its way to the beach nearby and was rescued by an RAF Short Sunderland.



ABOVE & BELOW Back on its undercarriage again, the Ensign has had its interim French civil registration applied with the simple substitution of the British "G" prefix letter with a French "F". One of the chief problems facing the groundcrew tasked with maintaining the big British airliner was the availability of spare tyres for the mainwheels, which were an impressive 6ft 3in (1.9m) in diameter. Happily for the crews, a cache of spares was located in Paris.





ABOVE Stripped of its British camouflage down to a bare-metal finish, the Ensign is seen here having its engines run up at Ouakam in French West Africa (now Senegal) in 1942. The aircraft's official registration, F-BAHD, has been applied and tricolour stripes added to the rudder, wings and aft fuselage, along with a large "F" on the fin.

several miles through the dunes to Nouakchott airfield, where repair work began. While there, the Ensign received the provisional French civil registration F-AFZV, a French "F" prefix simply replacing the British "G".

A NEW OWNER

In early March 1942 F-AFZV was offered to Air France, the airline's board designating M Larcher to determine how best the aircraft could be used. A new registration, F-BAHD, was accordingly assigned (although some sources, including some official records, mark it erroneously as F-BAHO). The availability of spare parts would be a major consideration, however, the Ensign having accrued about 800 airframe hours and 60 engine hours by this time. A particular obstacle seemed to be the tyres, which had been damaged by the towing operation. As the Ensign had previously served on the IAL/BOAC London—Paris and London—Marseille routes, Air France initiated a hunt for these precious tyres at Le Bourget and Marignane in May 1942. It appears that tyres and spare parts had been found at Le Bourget by June, but the approval of the German authorities for their disposal had yet to be acquired.

The Ensign was finally officially handed over to Air France in July 1942, performing a 15min test flight from Nouakchott on the 15th, followed by a 55min flight on the 21st. It was then transferred to Dakar in French West Africa (now Senegal) on a 1hr 45min flight on July 27. The British camouflage was removed and the French pseudo-registration F-AFZV was replaced with the official F-BAHD. It was also renamed *Nouakchott* and received regulatory tricolour bands, with "Air France" painted on the forward fuselage. According to some sources, it then performed a number of flights between Port Étienne in Mauritania,

ARMSTRONG WHITWORTH AW.27 ENSIGN Mk II DATA

Powerplant 4 x 1,100 h.p. Wright GR-1820-G102A Cyclone radial piston engines driving Hamilton Standard 23E50 107 metal propellers

Dimensions

| | | |
|-----------|----------------------|------------------------|
| Span | 123ft 0in | (37.5m) |
| Length | 114ft 0in | (33.8m) |
| Height | 23ft 0in | (7.0m) |
| Wing area | 2,450ft ² | (227.6m ²) |

Weights

| | | |
|--------|----------|------------|
| Empty | 36,590lb | (16,597kg) |
| Loaded | 55,500lb | (25,174kg) |

Wing loading

| | | |
|--|------------------------|-------------------------|
| | 22.6lb/ft ² | (110kg/m ²) |
|--|------------------------|-------------------------|

Performance

| | | |
|---------------------|---------------|------------|
| Maximum speed | | |
| at 7,200ft (2,200m) | 208 m.p.h. | (338km/h) |
| Cruise speed | | |
| at 5,000ft (1,500m) | 180 m.p.h. | (290km/h) |
| Climb | 900ft/min | (4.5m/sec) |
| Service ceiling | 24,000ft | (7,300m) |
| Normal range | 1,370 miles | (2,200km) |
| | at 170 m.p.h. | at 274km/h |
| | at 5,000ft | at 1,500m) |

Dakar in French West Africa and Bamako and Gao in French Sudan (now Mali). These are unconfirmed reports, however, and these flights seem rather unlikely.

In September 1942 the Ensign was ready to be returned to the French mainland by Air France crew members Fulachier and Merelard. The General Government of French West Africa proposed taking the opportunity to send food back to France, but authorisation to do so was refused by the Vichy government. The French



ABOVE A hive of activity, the *Ensign* is seen here at Agadir in 1942. Back in the UK, the inquiry into the *Ensign*'s loss concluded that, lacking any accurate measuring equipment, the crew had pumped too much oil into the engines from the auxiliary oil tanks fitted for the flight, resulting in the extensive oil leaks off the African coast.

West African government asked the relevant Vichy representative to make representations to the Air and Settlements ministries to allow future shipments, which were granted.

The *Ensign* was initially flown from Dakar to Algiers, Algeria, where it had arrived by early October. It was then to be flown to Marignane, near Marseille, but the issue of crossing the Mediterranean would have to be resolved; should the flight be made by day or by night? The former ran the risk of getting embroiled in action by Allied and Axis forces and the latter carried the inherent risks of night flying. A decision was made to take off from Algiers about an hour before daybreak, so that the *Ensign* could transit the area between the Balearic Islands and Marignane with minimum risk of encountering other aircraft.

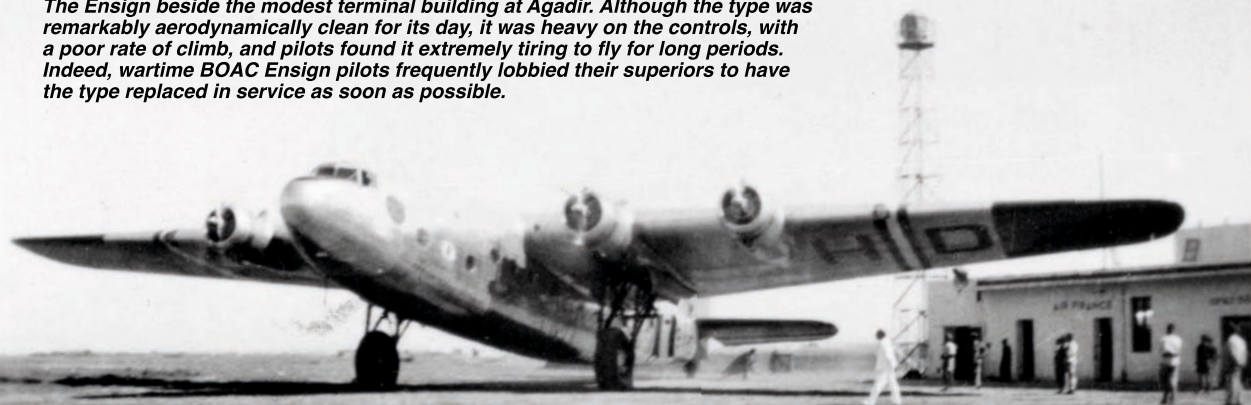
The *Ensign* finally arrived at Marignane in mid-October, with 1,127lb (510kg) of food for the Air France co-operative (set up by the company to help provide food for Air France employees

and their families) and a substantial load of unregistered parcels. Once back in France, it was necessary to notify the *Secrétariat d'État à l'Aviation* of the aircraft's arrival, and have the aircraft undergo the tests required to obtain its Certificate of Airworthiness (C of A).

PUT TO THE TORCH

The next question to arise was what to do with the aircraft after its C of A had been obtained. Air France's management proposed that it should be used as much as possible, notwithstanding the absence of spare parts. Empty, the *Ensign* weighed in at 32,050lb (14,535kg), plus 1,283gal (5,832lit) contained in its six wing tanks, and it undertook a 1hr 50min C of A test flight at the *Centre d'Études en Vol* (CEV) at Marignane on November 4, 1942, after which it was awarded a C of A and returned to Air France. However, owing to the German invasion of the *zone libre* in southern France in November 1942, Air France decided to withdraw

The Ensign beside the modest terminal building at Agadir. Although the type was remarkably aerodynamically clean for its day, it was heavy on the controls, with a poor rate of climb, and pilots found it extremely tiring to fly for long periods. Indeed, wartime BOAC Ensign pilots frequently lobbied their superiors to have the type replaced in service as soon as possible.





ABOVE Showing its shapely fuselage to good advantage, the Ensign sits on the ramp beside the hangar at Marignane, near Marseille, in 1942. That November the Ensign was moved for the final time to Montaudran, near Toulouse. **BELOW** Another of the German photographs showing the mangled remains of G-ADSX at Le Bourget.

'BAHD to Montaudran, near Toulouse, where the airline's maintenance workshops were located. Air France hurriedly withdrew it, along with an Amiot 354 and 370, Farman 2233 and Dewoitine 338, to Toulouse (a Dewoitine 338 and a Bloch 220 went to Vichy) on November 11, 1942, marking the Ensign's last flight.

Nevertheless, the Germans quickly managed to get their hands on it, formally taking the aircraft on strength in December 1942, the machine appearing on the list of 1,876 aircraft seized by the Germans after the invasion of southern France. Germany's *Reichsluftfahrtministerium* (RLM — Air Ministry) tasked German airline Lufthansa with undertaking a study of the Air France fleet in order to determine what could be used by the Luftwaffe and/or Lufthansa. The Ensign is mentioned specifically in a letter from Lufthansa to the RLM dated March 2, 1943:

"The concerned aircraft is a British airliner of an obsolete model, requisitioned by the French in West Africa and restored there. If the German authorities are not interested in the aircraft, Lufthansa is very interested in the allocation of the four Cyclone engines, which it urgently needs to maintain an adequate stock of spare engines to keep its fleet of DC-3s operational."

As a result, the four precious Wright engines were dismantled and transported to Berlin on June 1, 1943, and the airframe was abandoned at Montaudran, where the German authorities ordered its scrapping on site in December 1943, deeming the aircraft to be too visible from the air. An Air France report of May 31, 1944, confirms that the order had been completed.

Some sources, including *Armstrong Whitworth*



Aircraft Since 1913 by Oliver Tapper (Putnam, 1973), claim that at least one Ensign was recovered by the Germans and fitted with Daimler-Benz engines as a VIP transport. This would have involved intensive testing in order to satisfy the RLM. Reportedly used by the Luftwaffe, one was allegedly seen in Finland, but there the trail ends.

What we do know is that it was definitely not *Enterprise/Nouakchott*, which was destroyed on French territory without flying again. The only other possibilities are G-ADSZ *Elysian*, burnt out at Merville in May 1940 or G-ADSX *Ettrick*, damaged at Le Bourget the following month. Newly discovered photographs taken by German soldiers at the time clearly show that both were completely destroyed. The story of a supposed re-engined Ensign in German service remains, perhaps disappointingly, just a myth.



THE IMPERIAL IRANIAN AIR
FORCE FORMATION AEROBATIC
DISPLAY TEAM, 1958–79



IRAN'S GOLDEN CROWN

With the help of rare photographs, **BABAK TAGHVAEE** chronicles the history of the Imperial Iranian Air Force's Golden Crown formation aerobatic display team. Rarely seen outside Iran, the team's thrilling displays with F-84G Thunderjets, and later F-86Fs and Northrop F-5s, became an effective symbol of Iranian air power



DESPITE REGULAR threats to their funding and frequent attempts to subject them to sequestration, many of the world's air arms continue to maintain a formation aerobatic display team, seeing it as a projection of their nation's air-combat capability and a means to garner prestige on the world stage. Naturally, only the best pilots are chosen to represent their country in such teams.

Nearly 40 years ago the Imperial Iranian Air Force (IIAF) also had its own formation aerobatic display team, named *Taje Talaiee* (Golden Crown), made up of eight Northrop F-5Es tasked with demonstrating the prowess and capability of what was at the time the most powerful and modern air arm in the Middle East. Its disbandment in the wake of the Islamic Revolution of 1979 became a symbol of the decline of the IIAF and the nation's aviation industry. This article takes a look at the comparatively short but proud 21-year existence of Iran's Golden Crown.

EARLY DISPLAYS

The history of aerobatic demonstrations in Iran goes back to the establishment of the nation's first air arm, the Air Office of the Imperial Army (AOIA), in the early 1920s, when young Iranian pilots performed aerobatic displays at various public and official events, including anniversary celebrations of the 1921 "3rd Esfand (February 21) Liberation", which led to the establishment of the Pahlavi government. These aerobatic demonstrations were usually performed with the AOIA's Hawker Audaxes, Furies, Hinds and de Havilland Tiger Moths, which would be used in massive 20-aircraft, or in one case 90-aircraft, formation flights during parades. Usually, two or five of the aircraft would separate from the formation to perform simulated combat manoeuvres, such as mock aerial interceptions. In 1932 the Air Office of the Imperial Army was reorganised and the Imperial Iranian Air Force was established, all flying training being completed in Iran from that point.

By the middle of the 1950s Iran was receiving considerable economic and military support from the USA, owing to the latter's desire to prevent Iran becoming a vassal state of the Soviet Union. His Imperial Majesty Mohammad Reza Shah Pahlavi had initially explored acquiring jet fighters from the UK, USA and France in the late 1940s — but it was not until after an Anglo-American covert operation to depose the Iranian Prime Minister, Mohammed Mosaddegh, giving

the Shah absolute power, had been completed in 1953 that the USA agreed to deliver fighter jets to Iran. Before the jets could be delivered, however, it was necessary to train Iranian pilots and groundcrew to maintain the IIAF's new arrivals.

Accordingly, in 1955 Iranian technicians were sent to France and West Germany for training, and in January the following year the first group of Iranian pilots was sent to Fürstentfeldbruck in West Germany to convert to the Lockheed T-33A jet trainer. This group comprised 14 Republic F-47D Thunderbolt pilots of the 1st Independent Fighter Brigade, based at Ghale-Morghi Air Base near Tehran. Nine returned to Iran several months later, but the other five remained with the USAF's 7330th Flying Training Wing to complete an instructor course, and ultimately trained several Luftwaffe pilots during their assignment at Fürstentfeldbruck.

It was during this stay that, while relaxing at the base on a sunny day, the IIAF pilots saw the resident formation aerobatic display team practising manoeuvres, prompting them to think about establishing a similar team back in Iran. And so, after their return, the five shared their idea with the Shah, himself a keen aviator, who lent his support to the establishment of an IIAF formation aerobatic display team.

THE FIRST GOLDEN CROWN

In the summer of 1957 the IIAF's first eight Republic F-84G Thunderjets were delivered as part of the USA's Mutual Defence Assistance Program (MDAP). Between June and December that year Iranian pilots accrued 42 flying hours with the Thunderjets at the 1st Tactical Fighter Base (TFB) at Mehrabad in Tehran. By June 30, 1958, the number of F-84Gs in IIAF service had risen to 57, the number of flying hours for that year leaping to 4,251, by which time the Thunderjet pilots and their instructors had gained sufficient flying experience to perform even the most complex formation aerobatic manoeuvres.

The five most accomplished pilots were selected to be founder members of the IIAF's first Golden Crown formation aerobatic display team (see panel on page 27); and, on October 30, 1958, following the completion of some 147 training flights, the Golden Crown team performed its first display during an official IIAF ceremony in front of government officials, military commanders and some civilian spectators at Mehrabad International Airport, home to the 1st Independent Fighter Brigade (IFB).

The display began with five F-84Gs of the 1st

OPPOSITE PAGE *RAF Canberra pilot Colin Tavner poses beside a Golden Crown North American F-86F Sabre at Mehrabad Airport during an official visit by No 249 Sqn in November 1962. The following year the IIAF participated in its first overseas deployment, when four F-86Fs joined United Nations forces in Congo.* TOMMY CULLEN VIA AUTHOR



LEFT The five founder member pilots of the Golden Crown team strike a pose in front of their Republic F-84G Thunderjets in 1959. Front row, from left: 1st Lt Abdol-Hossein Minuspehr; team leader Capt Nader Jahanbani; Brig-Gen Mohammad Khatami. Back row, from left: Capt Amir-Hossein Rabi'i and Capt Siamak Jahanbini.

BELOW With their five F-84Gs in the background, the original Golden Crown team make their way back to the terminal at Mehrabad Airport in company with the pilots of the USAF's Skyblazers formation aerobatic display team — a North American F-100C Super Sabre of which is also visible at the extreme left of the photograph.

Fighter Squadron taxiing on to the runway at Mehrabad Airport, performing a five-aircraft formation take-off and heading westward. The first aerobatic manoeuvre was a five-aircraft delta-formation loop, the pilots maintaining a mere 2½ft (80cm) between their aircraft while flying at speeds of up to 560 m.p.h. (900km/h). Next came a Split-S manoeuvre, after which the aircraft changed positions, the fifth separating from the formation, leaving the remaining four Thunderjets to form a diamond formation. The fifth aircraft's role thereafter was to stand by to act as a reserve in case of an emergency or technical problem.

After another diamond-four loop, the formation executed a Cuban Eight, consisting of two half rolls and loops, still in diamond formation. After several more loops, another Cuban Eight and a final Clover Leaf manoeuvre, the flight leader performed a roll in front of the spectators, after which airbrakes were deployed and undercarriages lowered in preparation for landing, which was made in diamond formation. After landing, all five pilots were applauded by the spectators and commended by the Shah.

It was not all celebrations, however, as Golden Crown's No 4 pilot, Siamak Jahanbini, was killed during a team training flight later the same year. Indeed, there were numerous F-84G accidents over the next few years, the IIAF losing some of its best pilots and the aircraft acquiring the nickname "*khalaban kosh*" (pilot killer). As a result, plans were put in place to retire and replace the F-84G by 1963.

INTERNATIONAL CO-OPERATION

Meanwhile, the Golden Crown team continued with its Thunderjets, and, on June 5, 1959, participated in a joint performance with the Skyblazers, the formation aerobatic display team of USAF's 36th Fighter Group (FG), for thousands of Tehran residents. The joint display was performed by four Iranian F-84Gs and four North American F-100C Super Sabres.

On October 17 the same year the IIAF invited the Italian Air Force's *Lancieri Neri* (Black Lancers) formation aerobatic display team to perform a joint demonstration with the Golden Crown team during Iranian Air Force Week, held in Tehran. Six Italian Canadair CL-13 Sabres, together with



THE FAMOUS FIVE THE ORIGINAL GOLDEN CROWN TEAM MEMBERS



No 1 Captain Nader Jahanbani

Leader of the first Golden Crown team, Jahanbani began his aviation career in 1945 at a Soviet military flight school in Russia, after which he volunteered for the IIAF.

In 1951 Jahanbani became a flying instructor at the IIAF flight school at Mehrabad, and later became CO of the 1st Fighter Squadron, flying Hawker Hurricane IICs and Republic F-47Ds. In 1956 he was sent to West Germany to convert to the T-33A, after which he returned to Iran to become one of the nation's first jet instructors.

Jahanbani was selected to lead the Golden Crown team in 1958, having accrued some 3,000 flying hours, 900 on the F-84G and T-33A. Later appointed CO of the 4th TFB at Vahdati, he became the Minister of Sports and finally Deputy C-in-C of the IIAF. Jahanbani was arrested during the Islamic Revolution, on February 12, 1979, and in the early hours of March 13 that year he was executed in the courtyard of Qasr prison, aged 51. Reportedly, his last words were "Long Live Iran".

No 2 Brigadier General Mohammad Amir Khatami

Khatami joined the IIAF in 1939, but, after graduating as a fighter pilot in September 1941, flew little, owing to the Allies' wartime occupation of Iran. In 1944 Khatami was selected for twin-engined flying training in the UK. On his return he became Chief Flying Instructor at the IIAF flying school, before being promoted CO of the 1st Fighter Brigade, and then the 1st Fighter Squadron, at Ghale-Morghi. In 1946 Khatami was appointed the Shah's personal pilot, remaining in this position until the early 1960s, when the Shah began flying his own VIP aircraft.

In 1951 Khatami was sent to the UK again to fly Meteors with the RAF as part of a jet-familiarisation programme. On his return he was appointed Deputy Commander and later Commander of the IIAF's Fighter Regiment. In 1956 he joined Jahanbani on the Instructor Pilot training course in West Germany, and on his return was appointed Commander of the IIAF. Khatami was later awarded Iran's Order of Humayun 1st Class; foreign honours included the UK's Commander of the Royal Victorian Order (CVO) in March 1961 and Grand Cross, Order of Merit of the Federal Republic of Germany, in October 1965. Khatami remained C-in-C of the IIAF until he was killed in a mysterious kiting accident at Dezful in September 1975.

No 3 1st Lt Abdol-Hossein Minuspehr

Joining the IIAF in 1953, Minuspehr was sent to the USA for flying training that September, and after a year and a half of training received his wings as a twin-engined aircraft pilot. On his return Minuspehr was posted to the 1st Fighter Brigade to fly the F-47D. In December 1956 he was posted to West Germany for conversion to the T-33A, on which he passed the instructor course.

Minuspehr was 27 when he was selected for the No 3 position in the Golden Crown team; he had flown 1,900 hours including 1,100 hours on jet aircraft. He later became the first Iranian Grumman F-14A Tomcat pilot and was promoted CO of the 8th Tactical Fighter Base at Isfahan. Minuspehr left Iran for exile after the Islamic Revolution in 1979 and died in the USA in 2016.

No 4 Captain Siamak Jahanbini

Jahanbini joined the IIAF in 1949 and graduated as a 2nd Lt in 1952, before being sent to the USA for flying training. After completing a T-6 Instructor Pilot training course Jahanbini joined the IIAF's 1st Fighter Brigade, with which he flew the Hurricane and F-47D. He was then promoted Deputy Commander of the AT-6G Squadron of the 1st Fighter Brigade.

In December 1956 Jahanbini was sent to West Germany to convert to the T-33A. On his return he was appointed Operations Officer to the IIAF's 1st Fighter Squadron. In 1958, aged 30, having flown almost 2,000 hours, 1,000 on jets, Jahanbini was selected for the No 4 position in the Golden Crown team. Sadly, he was killed during a Golden Crown training flight later the same year.

No 5 Captain Amir-Hossein Rabi'i

In 1952 Rabi'i completed his training at the IIAF Air University, after which he was posted to the USA for further training, returning to fly the Hurricane and F-47D. In December 1956 Rabi'i joined his future teammates in West Germany for jet familiarisation training, after which he returned to Iran, where by 1958 he had logged 2,000 flying hours, 950 on jets. Rabi'i was 28 when he was selected as No 5, or reserve pilot, for the Golden Crown team. Having risen to the position of C-in-C of the IIAF by 1979, Rabi'i was arrested by the revolutionary forces and executed on the direct order of Ayatollah Khomeini.



ABOVE The IIAF took delivery of its first F-86F Sabres in early 1960, the Golden Crown team converting to the type the following year. The type remained the team's mount for the next ten years, this photograph showing the 1969 team with an F-86F. From left to right: Teymouri; Imanian; Jahanbani; Izadsetah; Abrishamian; Mofki and Rajabian.

nine IIAF F-84Gs, performed a joint display over Chitgar, west of Tehran.

The following February, an open day and airshow was held on the 12th at Mehrabad Airport. Personnel and pilots of USAFE's 36th FG were again invited to join the IIAF for the Golden Crown team's public debut with six recently delivered North American F-86F Sabres, which were accompanied by four USAFE F-100C Super Sabres.

For Iran's 1960 Military Day parade the Golden Crown team returned to the F-84G, four of which performed a display for the C-in-C of the IIAF and American Secretary of Defense Thomas S. Gates Jr at Mehrabad Airport on May 27. Five months later, the Skyblazers were once again invited by the IIAF to perform a joint performance with the Golden Crown team in Tehran on October 17 for Air Force Week. Six Golden Crown Thunderjets and four Skyblazers Super Sabres tore up the skies above Chitgar for the Shah and thousands of Tehran residents.

The team continued to fly the F-84G until 1961, by which time 52 F-86Fs had been handed over to the IIAF after overhaul in Spain, again under the provisions of the MDAP. Accordingly, the team converted to the F-86, a much more manoeuvrable and stable aircraft than the elderly Thunderjet.

The team's first official demonstration after the transition to the Sabre was performed on October 20, 1961, when four of the world's most famous formation aerobatic display teams came together for a joint display at Mehrabad for Air Force Week. Six Golden Crown F-86Fs joined together

with four F-100Cs of the Skyblazers, 12 RAF Hawker Hunters of No 92 Sqn's Blue Diamonds team and 12 Dassault Mystère IVs of the French formation aerobatic team, *Patrouille de France*. Four days later the team performed a six-aircraft display for the Shah and people of Dezful and Andimeshk at Vahdati AB on the occasion of the Shah's birthday and Air Force Week.

A few days later four Golden Crown F-86Fs were performing a display over Tehran when they commenced a manoeuvre the team had nicknamed "The Crossroads of Death", in which the paths of the four Sabres cross at high speed. Two of the aircraft, flown by 1st Lt Esmaeel Memari and 1st Lt Ghasem Farajwand, collided, killing both pilots. The Sabres came together at such speed that wreckage was strewn over a six-mile (10km) area of Tehran, some of it killing an electrical worker on the ground.

During 1962–63 the team moved to the 2nd TFB Vahdati (now 4th TFB Vahdati) at Dezful, where the Golden Crown pilots and aircraft were placed under the command of the 201st Tactical Fighter Squadron (TFS). October 1963 was a busy month for the team, with four-aircraft displays being performed as part of Aviation Week at Isfahan on the 9th, at the new airport at Shiraz on the 10th and at Abadan on the 11th. The final Aviation Week display was performed at the newly established 3rd TFB at Shahrokh at Hamadan on the 17th, in the presence of the Shah.

The Golden Crown team became a regular fixture during Aviation Week over the next four years, with four-aircraft displays being under-



ABOVE One of the Golden Crown Sabres rotates from the runway at Mehrabad Airport during a display in the early 1960s. Note the "U.S. Air Force" legend still visible on the bare-metal fuselage, the black letters having left their mark after removal. The identities of the 52 F-86Fs delivered to the IIAF as part of MDAP remain somewhat hazy.

taken near Fesa Bridge at Shiraz for the people of Fars Province on October 17, 1964, at Mehrabad Airport in the presence of the Shah on the same date the following year, for the people of Tehran on October 18, 1966 and again for His Imperial Majesty at Shahrokhi on October 17, 1967.

FAREWELL TO THE SABRE

In 1965 the IIAF had begun taking delivery of its new fighter, the Northrop F-5A, again under the provisions of the MDAP, and on October 17, 1968, the Golden Crown team performed its first display with the F-5A, using four examples from the 101st Tactical Fighter Squadron for a demonstration south of Kahrizak, in the presence of the royal family and thousands of spectators.

On November 11, 1969, the team reverted to six F-86Fs in a display for the Pakistani President, Yahya Khan, at Vahdati AB, and was still using the Sabre in October 1970, when the team performed

a show with four F-86Fs at Kushk-e Nosrat for thousands of spectators on the 17th.

In 1971 the IIAF's F-86Fs, including the six specially painted Golden Crown examples, were retired. Three were donated to the Iranian Civil Aviation Technology College (ICATC) in Tehran for training purposes, and three more were used as gate guardians at the IIAF's HQ at Dowshan-Tappeh, the 5th TFB at Tabriz (later 2nd TFB) and the 4th TFB at Shiraz (Later 7th TFB). Following the establishment of the 8th TFB at Khatami, near Isfahan, another former Golden Crown F-86F then being used by the college was restored for use as a gate-guardian at the base. In 1973 an ex-Golden Crown F-86F was restored for exhibition in a new part of the IIAF Museum at Ghale-Morghi airport.

After the Islamic Revolution of 1979, the ICATC's last remaining former Golden Crown F-86F was restored and delivered to the Sa'ad

BELOW Although nominally made up of seven aircraft at full strength, as seen here preparing for take-off in the mid-1960s, the Golden Crown team retained a high degree of flexibility for its performances, some using six aircraft (with one as a reserve), and often reverting to a four-aircraft formation for smaller shows and events.

ANUSHIRVAN JAHANBANI ARCHIVE VIA AUTHOR





ABOVE Taken during No 249 Sqn's Canberra visit in November 1962, this photo shows a crew member posing with the severed tail of one of the Sabres lost in the "Crossroads of Death" manoeuvre at Tehran in October 1961. Note the ancient Persian lion and sun symbol painted on the fin, the lion brandishing a shamshir (curved sabre).



ABOVE A Golden Crown team line-up poses with its seven Northrop F-5Es, painted with Western Arabic numerals on the fins, in 1976. From left to right: Maj Manuchehr Khalili (leader); 1st Lt Aminollah Bolghand; Capt Nosrat Dehkhargani; 1st Lt Masoud Kakwan; Capt Ghassem Golparvar; Capt Kazem Zarifkhadem; Capt Masoud Mostofi.



ABOVE The final six-man team of Golden Crown pilots and their groundcrew at a show circa 1978–79. The pilots, standing from left to right, are: Maj Khalili (team leader); 1st Lt Bolghand; 1st Lt Asadollah Akbari; Capt Zarifkhadem; Capt Yadollah Javadpour and 1st Lt Kakwan, who was probably standing in for Capt Dehkharghani.

Abad War Museum in Tehran circa 1989 in full Golden Crown colours.

During 1970–73 the Golden Crown team was essentially disbanded in the wake of the retirement of the Sabre. The idea of a formation aerobatic display team had not vanished, however, and the IIAF began making plans to reform the team with the F-5E Tiger II. In 1972 the Iranian government had ordered 32 F-5Es as part of the USA's *Peace Rush I* Foreign Military Sales (FMS) programme, with another order for 109 being supplied under *Peace Rush II* and 28 two-seat F-5Fs as part of *Peace Rush III* following in 1973.

Between February and October 1973 the initial batch of 32 *Peace Rush I* F-5Es was delivered to the IIAF. Accordingly, a cadre of experienced pilots was selected to undergo formation aerobatic training with the F-5E, several 203rd Tactical Training Squadron examples of which were used for displays during that year.

On June 11, 1973, the reconstituted Golden Crown team flew a joint performance with the US Navy's Blue Angels formation aerobatic team at Kushk-e Nosrat in northern central Iran. The Americans had been invited by the IIAF and arrived in Iran following their appearance at that year's Paris Air Salon. Six Iranian F-5As and six McDonnell Douglas F-4 Phantom IIs performed for thousands of Iranian spectators, including the IIAF's C-in-C.

During 1974–75 the Golden Crown team per-

formed displays at various celebrations throughout the country, including Air Force Day, Aviation Day, the Army Parade and Air Force Week. During this period of expansion for the IIAF, the Golden Crown team was seen as a valuable recruiting tool for the air arm.

REBIRTH

In 1976 the team moved to the 2nd TFB at Tabriz, where it was re-equipped with seven 21st TFS F-5Es, all of which were painted in a special colour scheme incorporating stripes of the national colours on the wings and fuselage and the Golden Crown insignia on the fuselage beneath the canopy. Each aircraft had a number painted on its fin, from "1" to "7".

During 1976–78 the team performed at least 20 displays all over Iran, most notably for the annual Air Force Day parade on October 17 at Isfahan. In 1977 the team was invited to appear at the Paris Air Salon; but the beginning of political troubles at home, particularly in Tabriz, the team's home base, as well as growing security threats from the Soviet Union, forced the team to cancel its plans for a Paris visit.

On October 17, 1978, the Golden Crown team performed its last demonstration, which took place at the Air Force Day parade at the 8th TFB at Isfahan. The final Golden Crown lineup comprised Maj Manuchehr Khalili (No 1, team leader); Capt Aminollah Bolghand (No 2,

The six F-5Es of the Golden Crown team await their next display at the 7th Tactical Fighter Base at Shiraz International Airport in the late 1970s. Some photographs show the F-5Es with Western Arabic numerals on their fins, but the majority show Persian Arabic (Farsi) numerals, as seen here. From left to right the aircraft are No 5, No 4, No 2, No 3 and No 6.

STAN LEE VIA AUTHOR



port wing; Capt Nosrat Dehkharghani (No 3, starboard wing); Capt Asadollah Akbari (No 4, "slot"); Capt Yadollah Javadvpour (No 5, solo 1); Capt Kazem Zarifkhadem (No 6, solo 2); 1st Lt Masoud Kakwan (No 7, reserve) and Capt Farhad Nassirkhani (commentator).

In January 1979, after more than a year of political unrest, the Shah left Iran for exile, and the following month the royal reign collapsed completely, giving way to the establishment of a theocratic Islamist republic led by Ayatollah Ruhollah Khomeini. The IIAF was perceived by the new leadership as an undesirable symbol of the Shah's Western influence, and sweeping changes — many of which would have a significant impact on the air arm's structure and efficiency — were made.

Pro-revolutionary IIAF cadets and technicians, known as *homafars*, formed Islamic councils, took control of the military air bases and began a series of widespread ideological and political purges within the air force ranks, weakening the air arm and providing what Iraqi leader Saddam Hussein saw as an opportunity to quell the revolution and invade Iran.

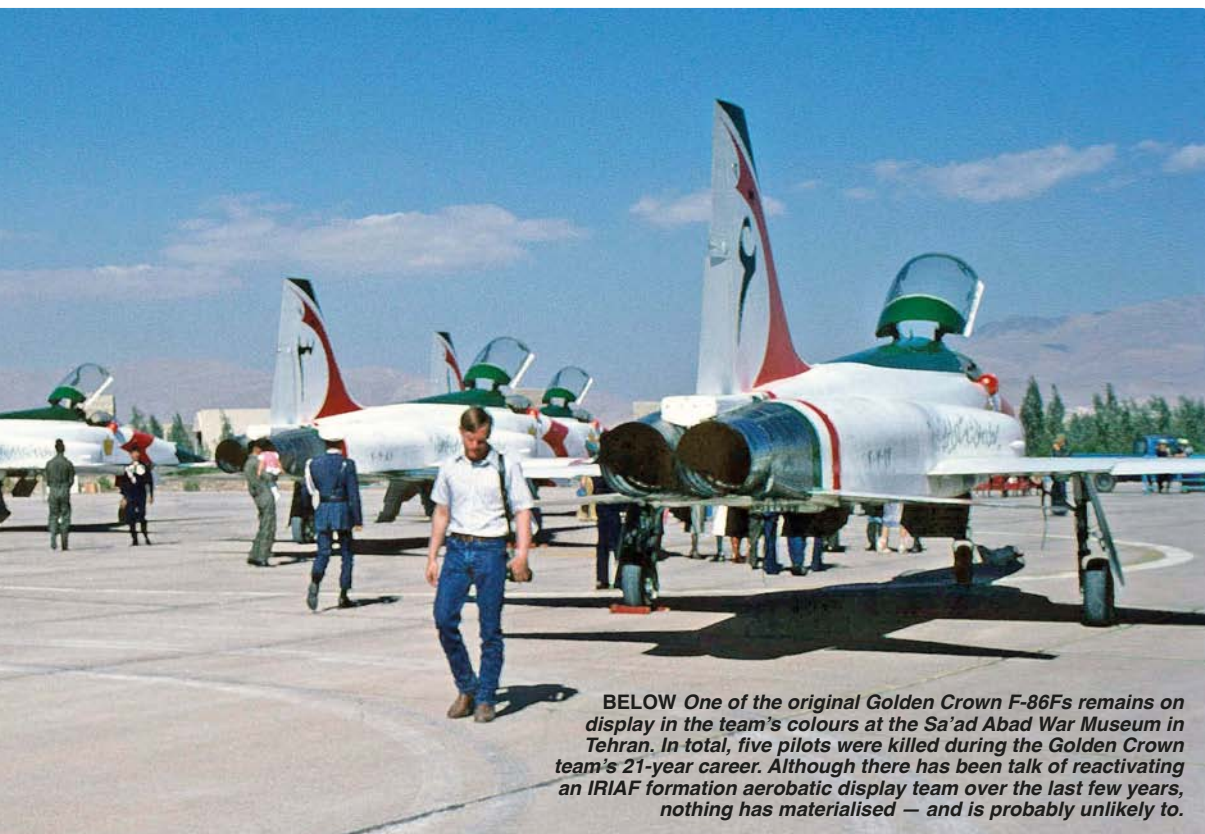
THE END OF THE ROAD

The Golden Crown team was disbanded and the colourful insignia of its aircraft masked with white or brown paint. The *homafars* prevented

any of the team's members, including the CO of the 21st TFS, Maj Bolghand, from entering the air base at Tabriz. Pilots Khalili, Bolghand and Nassirkhani saw the writing on the wall and left the country, but the remaining former Golden Crown team members were ordered by Col Javad Fakkuri, commander of the newly-constituted Islamic Republic of Iran Air Force (IRIAF), to return to their operational duties after the beginning of the Iran-Iraq war in September 1980. All returned except Masoud Kakwan, who was hired by an Iranian commercial airline.

Formerly the team's No 6, Kazem Zarifkhadem, and No 4, Asadollah Akbari, were killed during the war. Former No 3 Nosrat Dehkharghani became a prisoner of war and was returned to Iran after six years in captivity, and No 5, Yadollah Javadvpour, became an Iranian war hero after shooting down an Iraqi MiG-21 and Sukhoi Su-22 during the conflict. Unlike most of his teammates, Javadvpour managed to avoid arrest and retired from the IRIAF in the early 1990s.

With the end of the Iran-Iraq War in 1988, the IRIAF began making plans to establish a new formation aerobatic team in 1990, using four Pilatus PC-7Cs from its training squadron at Isfahan. One crashed into the Gavkhouni swamp near Isfahan, killing its pilot. In 2002 the IRIAF participated in the first Kish Airshow by fielding two PC-7Cs and F-5Bs, which performed



BELOW One of the original Golden Crown F-86Fs remains on display in the team's colours at the Sa'ad Abad War Museum in Tehran. In total, five pilots were killed during the Golden Crown team's 21-year career. Although there has been talk of reactivating an IRIAF formation aerobatic display team over the last few years, nothing has materialised — and is probably unlikely to.



BABAK TAGHVAEE

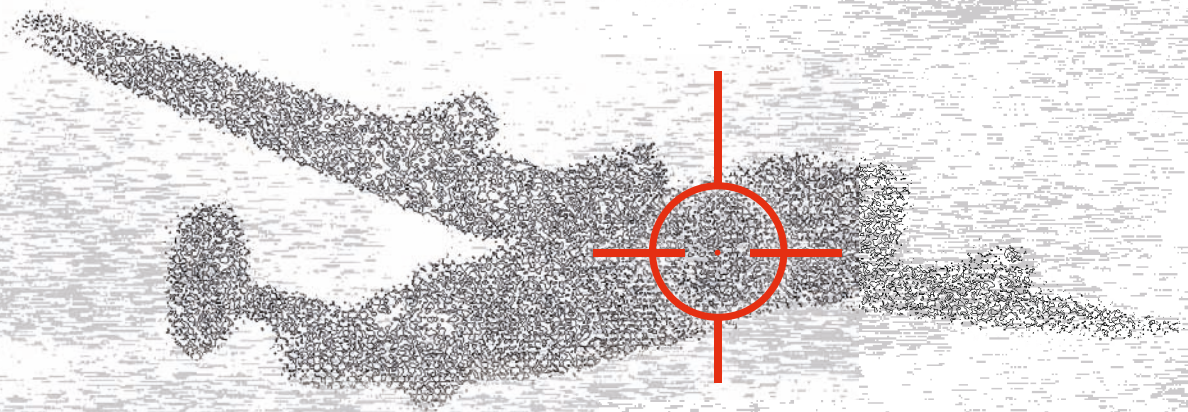
comparatively simple displays at the show. Owing to a lack of resources and potential fatigue issues with the F-5Bs, however, this experience was not repeated at subsequent Kish shows.

In 2012, during the sixth Kish Airshow, two Sukhoi Su-25KM Scorpions of the Islamic Revolutionary Guard Corps Aerospace Force (IRGCAF — a separate entity from the IRIAF) performed simple aerobatic manoeuvres. In June 2014 all of the IRGCAF's Su-25s were delivered to the Iraqi Air Force to be used against *Da'esh*

(aka ISIL) forces, putting paid to any further plans for display flights.

In March 2012 the IRIAF's Strategic Research & Studies Office invited all the surviving former Golden Crown team pilots to a reunion, in which they were honoured and invited to discuss plans and provide advice for the possible creation of a new IRIAF formation aerobatic team. Perhaps unsurprisingly, the plan failed to gain traction with the top brass, and ultimately the idea came to nothing.





A TRAGEDY OF ERRORS

In January 1942 BOAC Liberator G-AGDR completed the outbound half of a trial service from the UK to Egypt; two weeks later, after a series of garbled messages between BOAC and the RAF about a revised route for the return flight, the aircraft became the victim of a tragic “friendly fire” incident, as **BOB LIVINGSTONE** relates

THE HISTORY OF the British early-model Consolidated Liberators used for ferrying and transport duties during 1941–42 is rife with tragic stories; but none more so than the loss of Liberator Mk I AM918/G-AGDR in February 1942, in what today would be called a “friendly fire” incident.

The early-contract Liberators ordered by the British from Consolidated comprised six LB-30As (AM258–AM263, equivalent to the USAAF’s YB-24) and 20 LB-30B/Liberator B Mk Is (AM910–AM929, equivalent to the B-24A), none of which was fitted with self-sealing tanks, armour-plate or supercharged engines, and which carried only a small number of hand-operated defensive machine-guns. All of the LB-30As and three of the Liberator Is were immediately converted for transport duties for the Atlantic Ferry Organisation (Atfero), while the remainder of the Liberator Is became test airframes or were modified for anti-submarine duties over the Atlantic. Atfero was a British Air Ministry/Canadian Pacific Railway Co (CPR) partnership established in July 1940 to facilitate the air delivery of American-built combat aircraft

from Canada to the UK. The first flight (of seven Lockheed Hudsons led by future Pathfinder Don Bennett) began in November that year.

Initially the ferry crews were returned to Canada by ship, but this took between ten and 14 days and the backlog of aircraft to be ferried was becoming severe. The availability of the Liberators was seen as a godsend, and the first eastbound flight, christened the Return Ferry Service (RFS), was made on May 4, 1941. The crews were a mixture of RAF and civilian British Overseas Airways Corporation (BOAC) personnel, and passenger accommodation was initially little more than mattresses and blankets on the floor of the unheated bomb bays, where temperatures could plummet to -40°C. Improvements were made progressively, however; combustion heaters were replaced by tapping exhaust heat from the engines and 14 seats were installed aft of the bomb bays, which were then available for cargo.

The contract with CPR expired in July 1941, permitting the RFS to become an all-government enterprise. As a result, RAF Ferry Command was established on July 20, 1941. On September 24 that year BOAC was given the responsibility

for the day-to-day operation, maintenance and crewing of the RFS. Only ferry crews, important civil servants and official freight and mail were permitted on the flights.

Of the three Liberator Is allocated to the RFS, AM915 was delayed into service until August as its tailplane had been removed and fitted to AM260, owing to considerable cracking found in the tail of the latter in May 1941; AM918 was flown from Gander to Prestwick on the night of May 13–14, 1941, by Wg Cdr John Francis, and AM920 was delivered the same night. The latter two were allocated to Scottish Aviation Ltd at Prestwick, which modified the aircraft for their transport role.

THE MIDDLE EAST ROUTE

The first RFS flight for Atfero by AM918 was made on May 26, 1941, the aircraft flying regularly until it and one of the LB-30As, AM263, were withdrawn from the RFS for special service on a direct route from Hurn on the English South Coast to Cairo, Egypt, in January 1942. Both were added to the British civil register, as G-AGDR and G-AGDS respectively. The war situation in North Africa at the time was that Auchinleck had pushed Rommel back and Tobruk, Benghazi, Bardia and Halfaya had been retaken, although on January 21 Rommel counter-attacked. The purpose of the Hurn—Cairo flight has not been conclusively identified, but it appears to have been the first of what was to be a regular service.

Damaged by an engine fire at Prestwick on December 12, 1941, AM263 took some time to be repaired and was withdrawn from the service, its civil registration lapsing, leaving just AM918. The latter's Certificate of Airworthiness as G-AGDR was issued on January 5, 1942, but the

aircraft was unable to proceed to Hurn owing to fuel system problems. It was not until January 24 that Capt R. Humphrey Page was able to ferry the aircraft to Hurn, where it was prepared for the onward flight.

On the night of January 25–26, 1942, G-AGDR departed Hurn on the initial proving flight to Cairo West (also known as LG224 Kilo 26) via a circuitous route, the latter devised to minimise the chance of fighter interception, and arrived 11hr 15min later. On January 27, in preparation for the return flight, planned for that evening, No 44 Group sent the following secret signal:

"Liberators on UK/ME [Middle East] route to burn 'resin' lights or fly below 5,000ft [1,500m] when over land on approach or leaving UK."

It is at this point that the flight back to the UK begins to unravel. It is hinted in BOAC's official report that on arrival at Cairo West, G-AGDR was at the limit of its endurance. This seems odd, as a Liberator could comfortably fly for 13hr, and Qantas and the RAF would later frequently fly Liberators for 16–20hr; some flights of 22–24hr were even recorded. Given G-AGDR's proposed TAS (true air speed) of 200kt (the longer flights probably operating at 150kt), it still fails to ring true. Nevertheless, this has been offered as the reason why Capt Page put forward a revised route for the return flight.

Several days of forecast strong headwinds caused the return flight to be repeatedly delayed. A conference was held on February 6 with the HQ Middle East RAF Operations Controller at RAF Almaza (LG245), in which Page proposed an alternative route which was practically the rhumb-line track direct from Cairo to Hurn.

[Rhumb line: an arc crossing all meridians of longitude at the same angle; a path with constant



ABOVE It appears that Liberator I AM918/G-AGDR was somewhat camera-shy in the ten months between its arrival in the UK in May 1941 and its loss in February the following year. It was one of a batch of 20 LB-30B/Liberator Is, also including AM922, as seen here, which joined No 120 Sqn at Nutts Corner in June 1941.

Although arguably far from the front line, flying with RAF Ferry Command was by no means an easy option — some 44 Ferry Command crew and passengers were killed in August 1941 alone, with a further ten that September. Conditions aboard the organisation's Liberators were primitive, with the cold proving to be the greatest enemy.



AUTHOR'S COLLECTION

bearing as measured relative to true or magnetic north — Ed.]

Middle East HQ considered that it would be safe to fly at 20,000ft (6,100m) and sent a signal regarding the security of the proposed route to the Air Ministry in the UK on February 7; BOAC Cairo was advised that the Air Ministry concurred. Consequently, on the 8th, HQ ME sent signal A.546 to BOAC Bristol, raising the question of enemy interception and ground hazards as follows:

"In view very small margin of endurance of Liberator AM918 [sic] on flight Egypt—United Kingdom and continued unfavourable weather, propose following alteration in route return flight Liberator G-AGDR to UK: [RAF EI] Daba to 34° 10'N, 22° 30'E; to 42°N, 18°E; to Hurn all tracks rhumb line eight; not below 20,000ft REPEAT 20,000ft; landfall English coast dawn; Intelligence Air Ministry state[s] that risks of interception by enemy air defence on route are small; weather forecast for route is being prepared in co-operation with Air Ministry meteor[ologist]s; indications are that weather is unlikely to be much worse than on original route; possibility of slightly stronger headwinds is counterbalanced by great decrease in distance; request concurrence to proposal if new route satisfactory; suggest consideration be given to its permanent use or at least as alternative during winter months. AM [Air Ministry] Whitehall, please pass to 44 Group."

The reply from No 44 Group (A.284) advised against the proposed new route, but BOAC Cairo was not satisfied that this had been cleared by Bristol, so signalled back on February 9 (AZ500):

"Is RAF signal A.284 of February 8 your reply to HQ RAF Middle East [signal] A.546, addressed to you care of Air Ministry [?]; if not what is your reply [?]"

The situation was getting out of control. Bristol replied with signal JP743 on the 11th:

"AZ500; on forecast for last night, route described [in] RAF signal A.546 shows saving in flight time 1hr 38min assuming TAS 200kt. Do not consider this outweighs risk. Lisbon impossible for Liberators until new aerodrome [at] Portela available [in] near future."

Without stating it in black and white, Bristol was saying that the proposed direct route was not satisfactory owing to the lack of an alternate diversionary airfield and agreeing with No 44 Group, but the signal arrived in a mutilated form which left the impression that Bristol had no objection. Just to be sure, BOAC Cairo checked back with Bristol (AZ519), but no reply had been received by February 14, and the aircraft departed at 1925hr GMT with a flight plan indicating a flight time of 13hr 10min, although Page was of the opinion that the actual headwinds would be less than forecast.

Bristol's reply to AZ519 (JP755) was received at 2100hr GMT on the 14th, more than an hour and a half after the aircraft's departure, stating clearly that the aircraft was NOT to fly the direct route on this first return voyage and that the proposal would be fully discussed with No 44 Group on completion of the flight. BOAC Cairo took no action to recall the aircraft nor did it advise that the aircraft had already departed on the direct route. An estimated time of arrival (ETA) for "Point H" was included, however,



MAP BY MAGGIE NELSON

which suggested that the aircraft was on its way, but it was not detected. The situation was spiralling further out of control.

"HOSTILE" TO "UNIDENTIFIED"

At 1537hr GMT on the 14th No 44 Group had received a signal noting G-AGDR's impending departure, and No 10 Group was asked to make arrangements for fighter escort in case the aircraft was late and was flying in daylight. At 0300hr on the 15th No 44 Group received the aircraft's actual departure time, along with its ETA — 0616hr GMT — at its turning point west of St Nazaire on the Brittany coast.

At 0600hr No 44 Group asked No 10 Group if it had any radar plots which might be G-AGDR, but it was not until 0712hr GMT that radar revealed a plot of an aircraft at 25,000ft (7,600m) which had crossed the French coast on the eastern side of St Brieuc Bay, and was heading north towards the Channel Islands. The radar plot was initially classified as "hostile", but was shortly afterwards downgraded to "unidentified". As a precaution, No 10 Group

THE MANIFEST

Liberator G-AGDR was carrying nine crew and passengers when it was lost on February 15, 1942

Crew Capt R.H. Page; Capt J.A.S. Hunter; First Officer R. Williamson; Radio Officer H. Parker; Engineer Officer H. Spicer

Passengers Brigadier F. Morris, Royal Army Ordnance Corps; Lt C.O.M. Vine, RN; Lt-Col Townsend Griffiss, USAAF; Mr H.E. Bell of the Air Ministry, believed to be an official of Rolls-Royce

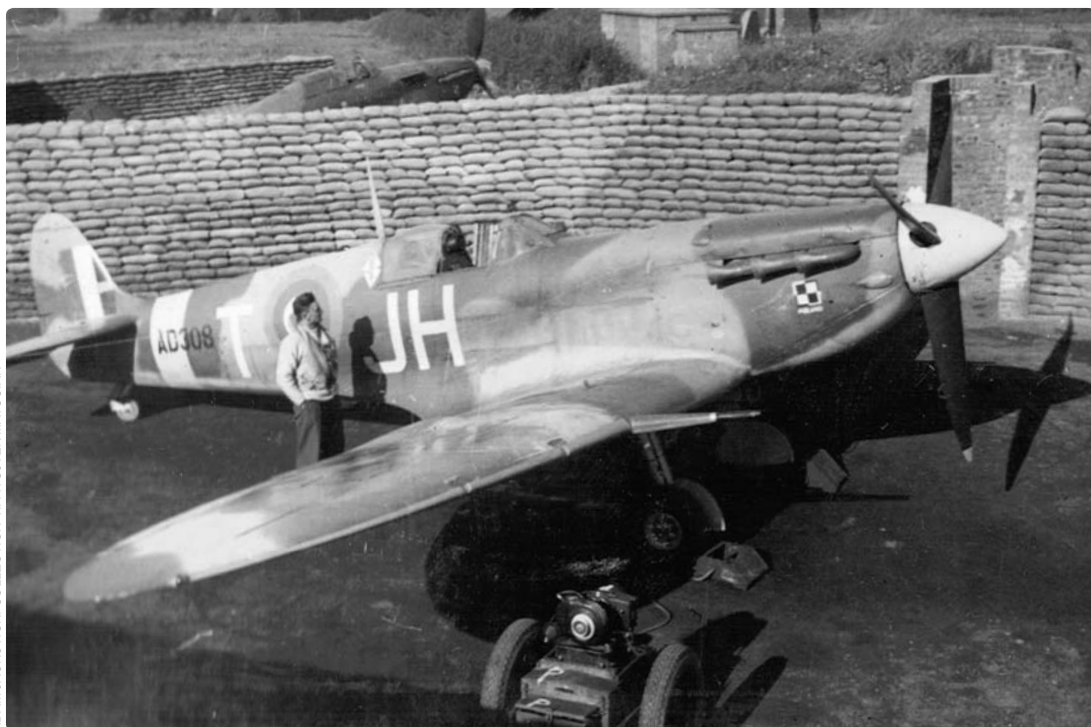
The balance of the load consisted of diplomatic, troops' mail and BOAC correspondence

scrambled two Supermarine Spitfire Mk Vs — Castle Bromwich-built AD308/JH-T, flown by Flt Sgt Stanislaw Brzeski and Westland-built AR279/JH-R, flown by Sgt Jan Malinowski — of Exeter-based No 317 ("Wileński") Sqn on detachment to Bolt Head as Red Section.

Once airborne Brzeski and Malinowski were directed in Polish by a Polish controller to circle at the estimated point of interception, but they

Liberator I AM918/G-AGDR was probably finished in Dark Earth and Dark Green upper camouflage and Aluminium-painted undersides.
Artwork by JUANITA FRANZI / AERO ILLUSTRATIONS © 2017





ABOVE Flying Officer Tadeusz Koc stands beside Spitfire Mk VB AD308, one of the first to be delivered to No 317 ("Wileński") Sqn, in October 1941. It was this aircraft, along with Westland-built Spitfire Mk VB AR279, that encountered G-AGDR on the latter's fateful return flight from Cairo in the early hours of February 15, 1942.

were already passing out of radio range. They were advised that it might be a "friendly" and, shortly afterwards, that it was thought to be a Liberator. Neither of these messages was apparently received by the pilots.

Brzeski and Malinowski were instructed to steer 330° as the aircraft had passed them, after which they saw it at a distance of about ten miles (16km). Further calls were made by the controller advising that the aircraft was a Liberator and friendly, but, because he had not changed to an advanced transmitter on the coast, these calls were also not received. The Spitfire pilots identified the aircraft as a Focke-Wulf Fw 200, and as they closed in, one of them saw a bright flash coming from a "glass turret". The transport turned and began to dive into cloud.

Both Spitfires opened fire; one of the

Liberator's starboard engines was hit and started smoking, and the aircraft disappeared from view. Shortly afterwards, emerging beneath the cloud, the pilots saw a large patch of oil and disturbed water in the Channel, about five miles (8km) south-west of the Eddystone Lighthouse.

THE AFTERMATH

All five crew and four passengers aboard the transport were killed and no bodies were recovered, but among the remains found were some socks belonging to the First Officer, some bags of diplomatic mail which should have sunk but for some reason floated and a leather bag belonging to one of the passengers, Lt-Col Townsend Griffiss (see panel on opposite page).

As per usual procedure, a Court of Inquiry was convened, and, while full details are not

Spitfire VB AD308 bore the No 317 Sqn unit code "JH-T", and was painted in the RAF's post-August 1941 day fighter scheme of Dark Green/Ocean Grey camouflage with Sea Grey Medium undersides. The Polish national insignia was applied to the cowlings and the unit's bird motif was painted behind the cockpit.



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LT-COL TOWNSEND "TIM" GRIFFISS

ONE OF THE passengers aboard G-AGDR, 41-year-old Lt-Col Townsend "Tim" Griffiss (**RIGHT**), became the first USAAF officer to be killed in Europe after America entered the war. The scion of a wealthy family, Griffiss (incorrectly named in the BOAC loading list as Griffiths) was a former fighter pilot and one of the first American officers sent to London in 1941, as an aide to Gen James Chaney as a "special observer" — officially neutral, but in reality preparing the ground for the military alliance that would become public after Pearl Harbor. Arriving in Europe in 1935, Griffiss spent most of his time during 1936–38 observing the civil war in Spain at close quarters as the USA's Assistant Military Air Attaché in Paris, Berlin and Spain.

In November 1941 Griffiss was detached from Chaney's staff and sent to Moscow to negotiate with the Soviet government about the opening of an Alaska—Siberia (ALSIB) air route for American Lend-Lease aircraft. He spent about two months in the Soviet Union, first in Moscow, then, when German forces reached the outskirts of the city, in Kuibyshev (now Samara), the temporary wartime capital. Cold weather delayed Griffiss's departure, and from Kuibyshev he went to Tehran in Iran, and from there to Cairo, where he boarded Liberator G-AGDR.

After the enquiry released its findings, Gen Chaney wrote to the US Army Adjutant General with the findings, requesting that "no publicity be given to findings of [the] Court of Inquiry. Formal certificate of death will be forwarded as soon as issued by British Casualty Section. Request this information be furnished also Chief of Army Air Forces". Griffiss received the Distinguished Service Medal posthumously for his work in London and in the Soviet Union. The citation stated that he displayed rare judgment and devotion to duty and contributed materially to the successful operation of the Special Army Observers Group in London. A corner of Bushy Park in West London offers the faintest of reminders. Here, half covered over by grass, are a handful of tablets in the earth, marking the various blocks of Camp Griffiss, the British headquarters of the USAAF, established in the summer of 1942. **BL**



available, both pilots were blamed for failing to identify the Liberator as a friendly aircraft before opening fire, and courts martial were recommended. However, it was later decided that there was insufficient evidence to proceed. The Inquiry report stated the following:

"The cause of the accident was, in our opinion, the failure of Flt Sgt Brzeski (**RIGHT**) and Sgt Malinowski to identify AM918 as a friendly aircraft, resulting in their jointly shooting down the said aircraft. The weather and visibility at the place and time of the interception were such that no excuse on these grounds can be accepted."

Brzeski — at the time of the incident an ace with five kills and two shared, with more to come — was commissioned not long afterwards, and Malinowski was promoted Flight Sergeant. Brzeski was shot down and became a prisoner of war in May 1945, returning to the UK after the war and remaining in the RAF. Malinowski returned to Poland after the war and helped set up the nation's air emergency medical service during the 1950s. Blame was also laid at the door of No 10 Group, which, according to the subsequent report, "failed to notify [its] fighter sectors that a friendly aircraft was expected through [its] territory, yet [had been] warned by No 44 Group and conversed with that Group on the supposition that the unidentified aircraft was the Liberator."

The two Spitfires involved lasted only another month. Both flew on *Roadstead 12*, a low-level attack on enemy shipping, on March 15, 1942, the pair making forced landings near Bolt Head



WOJTEK MATUSIAK COLLECTION

after running out of fuel. Both were written off.


The Hurn—Cairo—Hurn service did not continue, Liberators not returning to the route until July 1942 when they carried emergency ammunition supplies for the beleaguered British forces in North Africa. [*See Ray Flude's Some Supreme Effort in TAH10 — Ed.*]

A postscript to G-AGDR's tragic loss emerged in 1995 in the probate of the will of Miss Margaret Gill of Walton-on-the-Hill. She left £400,000 to the Wells-next-the-Sea Lifeboat Station in Norfolk as a tribute to the copilot of G-AGDR, John Hunter — who had taught her to fly before the war — as someone lost at sea.



ACKNOWLEDGMENTS *The Editor would like to thank the late John Havers, Wojtek Matusiak and Adam Jackowski for their invaluable research and assistance during the preparation of this article*

The War of the Roses air race



Yorkshire vs Lancashire, October 1913

The fierce rivalry between the English counties of Lancashire and Yorkshire has been the spur for competition of all kinds since the 15th Century, so it was perhaps inevitable that the development of aviation in both would lead to a test of the best machines from each.

NICK FORDER studies the form of both contenders and provides a full race commentary





THE LONGSTANDING rivalry between Lancashire and Yorkshire dates back to the so-called “Wars of the Roses”, when the House of Lancaster — represented by a red rose — fought the House of York — a white rose — for control of 15th-Century England. Since then, the rivalry has largely become confined to sporting events. In 1913 it took to the air.

On September 20, 1913, the prototype Avro 504 made a great impact on its public debut by coming fourth in the Aerial Derby over London at an average speed of 66.5 m.p.h. (107km/h). The aviation press was greatly impressed, predicting large military orders for the type. Recognising that the 504 was made by A.V. Roe & Co of Manchester (traditionally part of Lancashire), the Editor of the *Yorkshire Evening*

News was convinced that Yorkshire products were superior, and responded by offering a trophy to the winner of an air race between the best aeroplanes Lancashire and Yorkshire could offer. This race was to be over a 100-mile (160km) course. Inevitably, the event was promoted as the “War of the Roses Air Race”.

Avro vs Blackburn

The foremost Yorkshire aviation company at this time was the Leeds-based Blackburn Aeroplane & Motor Co Ltd. Prompted by the challenge laid down by the *Yorkshire Evening News*, and encouraged by the Yorkshire Aero Club, Blackburn issued an official challenge to A.V. Roe in Manchester. Co-founder of the company Humphrey Verdon Roe, who saw an opportunity for publicity, accepted, and the race was on.



MAIN PICTURE With all aboard in both aircraft, the Avro 504 prototype and Blackburn Type I prepare to join battle during the “War of the Roses” Air Race over Yorkshire on October 2, 1913. In charge of the Avro was F.P. Raynham (TOP LEFT) while the Blackburn monoplane was piloted by Harold Blackburn (TOP RIGHT) — no relation to the company’s founder Robert Blackburn.

MAIN PICTURE VIA AUTHOR / PORTRAITS PHILIP JARRETT COLLECTION



ABOVE The Avro 504 prototype in its original configuration (in which it raced in October 1913) with a square cowling bulged to accommodate the 80 h.p. Gnome rotary engine. By the time the aircraft was the subject of a technical assessment in *Flight* that December, as seen **OPPOSITE**, a more streamlined cowling had been fitted.

The 504 had been developed, built and tested in some secrecy, to the extent that an article on Aerial Derby entrants in British aviation weekly *Flight* used an illustration of the company's earlier Type 500. Work on the 504 started in the basement workshop at Brownsfield Mill in Manchester's Great Ancoats Street, but was completed at the new Clifton Street works at Miles Platting, a mile or so further out of the city. The prototype was delivered to Brooklands in Surrey on September 17, 1913, and made its maiden flight the next day, arriving at Hendon on the morning of September 20 to take part in the Aerial Derby. Thus it was not until December 6 that year that *Flight* published a feature praising the new type, as follows:

"With his new 80 h.p. biplane, Mr A.V. Roe has proved that it is possible today to produce a machine of the biplane type which is as fast as, if not faster than, most monoplanes, and which, moreover, has the advantage that it can be landed at a speed which is very much below its normal flying speed.

"In the front portion of the fuselage, and enclosed by one of the neatest aluminium shields we have seen, is the engine — an 80 h.p. Gnome — which is carried in double bearings, the front one of which is formed by four tubular extensions of the longerons which converge until they meet on a channel steel ring which carries the front ballbearing. A small inspection door on each side of the engine housing permits of a general examination of the magneto, carburettor, oil pump etc, whilst for close inspection the whole engine housing can be removed by undoing the butterfly fasteners by means of which the cowl is attached to the fuselage.

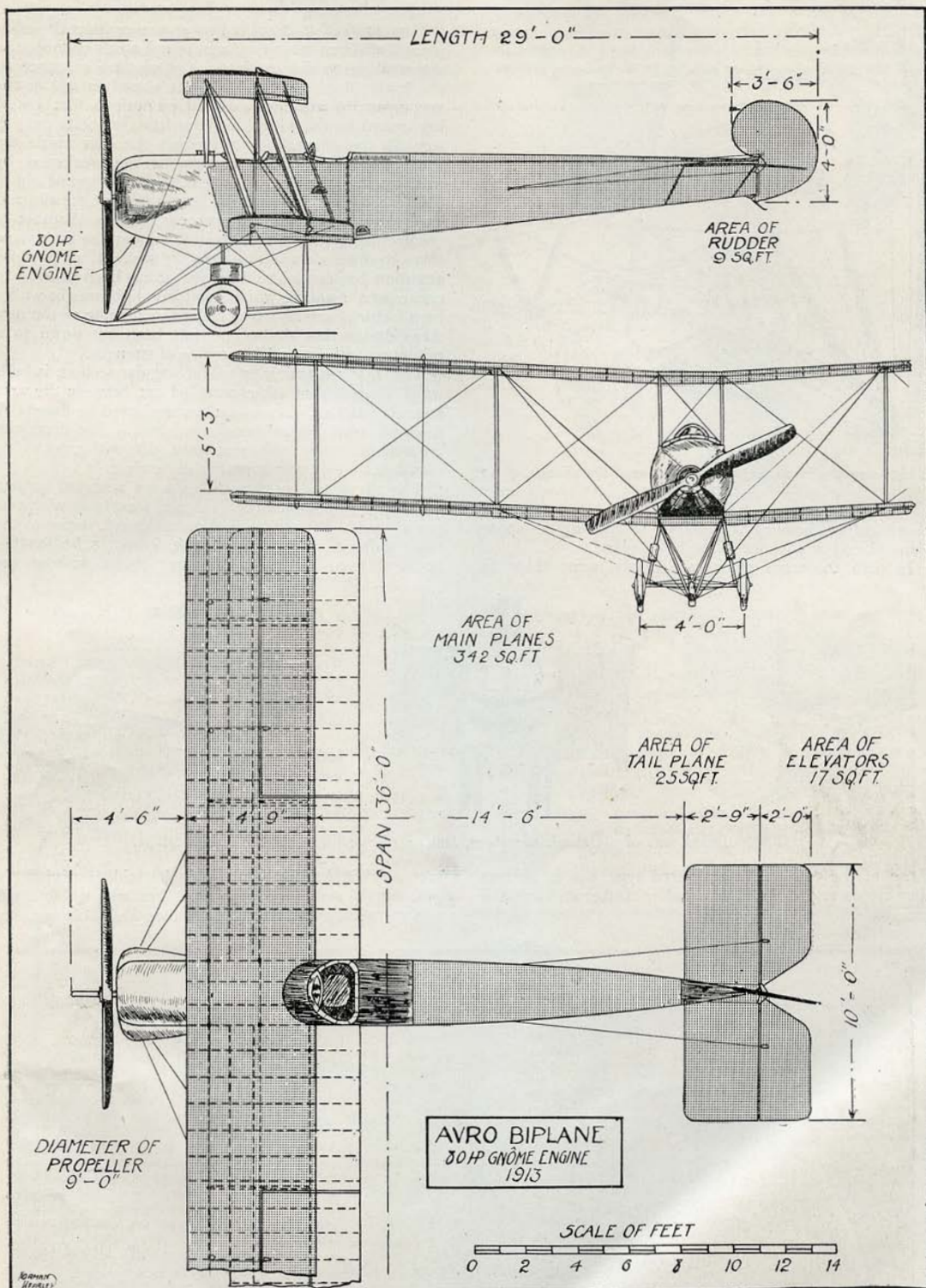
"The planes as well as the fuselage are covered with a fabric, which has squares of stronger threads woven into it, so that should the fabric become pierced by a bullet or [other] cause, these squares will prevent the fabric from tearing.

"The pilot's and passenger's seats are arranged tandem fashion, the pilot occupying the rear seat, from where he has an excellent view in all directions, and, owing to the small width of the fuselage — 2ft 6in [76cm] to be exact — he is able to survey the country below without the necessity of leaning out over the side. From the passenger's seat an equally excellent view and the windshield enables him to make his observations in comfort, protected as he is against the flow of air.

"During the official tests at Farnborough recently, we understand, the machine, with pilot, passenger and four hours' fuel, climbed 1,000ft [300m] in 1.75min. Her maximum speed was 80 m.p.h. [128km/h] and her minimum speed 43 m.p.h. [69km/h], thus giving a speed range of nearly 50 per cent. The weight of the machine with fuel for three hours and a passenger is 1,550lb [703kg], giving a loading of about 4.5lb/ft² [22kg/m²]."

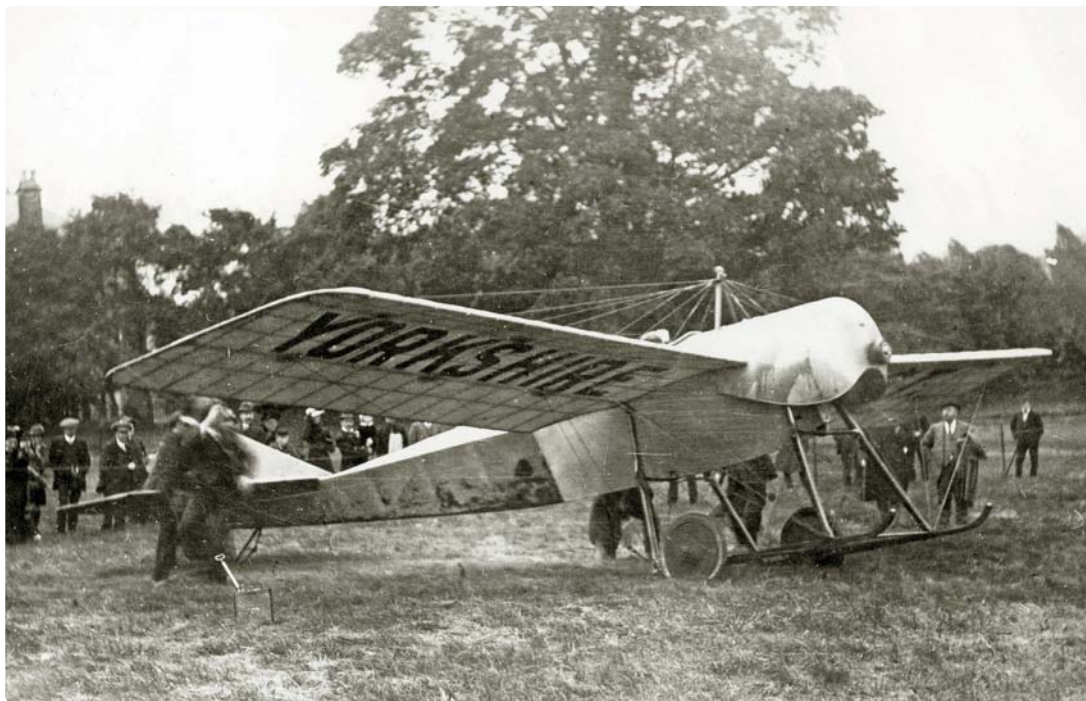
Make-or-break for Avro

It should be noted, however, that *Flight* was reporting on the developed prototype which, by the time it arrived at the Royal Aircraft Factory for testing, had been fitted with revised ailerons and a new more streamlined engine cowling. The 504 was described at the time as a larger development of the successful Avro Type E which had gone into production as the Type 500 and been sold to the War Office and Admiralty.



THE 80 H.P. AVRO BIPLANE.—Plan, side and front elevation to scale.

"Flight" Copyright.



ABOVE Three examples of the Blackburn Type I were built: the “War of the Roses” two-seater owned by Dr M.G. Christie (the subject of the *Flight* report in December 1913, as seen **OPPOSITE**); a single-seater with a single kingpost, and the Improved Type I, as seen here in 1914, fitted with a single kingpost and a smaller tailplane.

Powered by a 50 h.p. Gnome rotary engine, the 500 was really too small and underpowered for military use and was used mostly as a trainer. However, problems in securing a more powerful engine and A.V. Roe’s diversion in producing the innovative, but ultimately unsuccessful, Types F and G enclosed-cockpit monoplane and biplane, caused Avro to miss the opportunity offered by the 1912 Military Trials to identify designs suitable for the newly formed Royal Flying Corps. So it was not until November that year that work started on what would become the 504, and April 1913 before the basic layout and some details of it had been sketched out in an exercise book by A.V. Roe. Although plainly influenced by the 500, including the retention of a narrow-track undercarriage, the 504 differed in having wings with forward stagger and was powered by a new 80 h.p. Gnome rotary engine.

Although the earlier Avro designs had been worked on by volunteers and students in exchange for flying lessons, the commercial success of the 500 had allowed Humphrey Verdon Roe to expand the company. Reg Parrott became Works Manager in Manchester and Roy Chadwick took over responsibility for design work. Chadwick and his assistant, C.R. Taylor, worked on the fuselage and undercarriage, while Harry Broadsmith, a former locomotive and marine engineering apprentice, was given responsibility for developing the wing design. Broadsmith had been taken on as a draughtsman

the year before, and now found himself Chief Draughtsman. Frank Vernon was recruited from the Locomotive Department of the Great Central Railway to work on stress calculations as Broadsmith’s assistant.

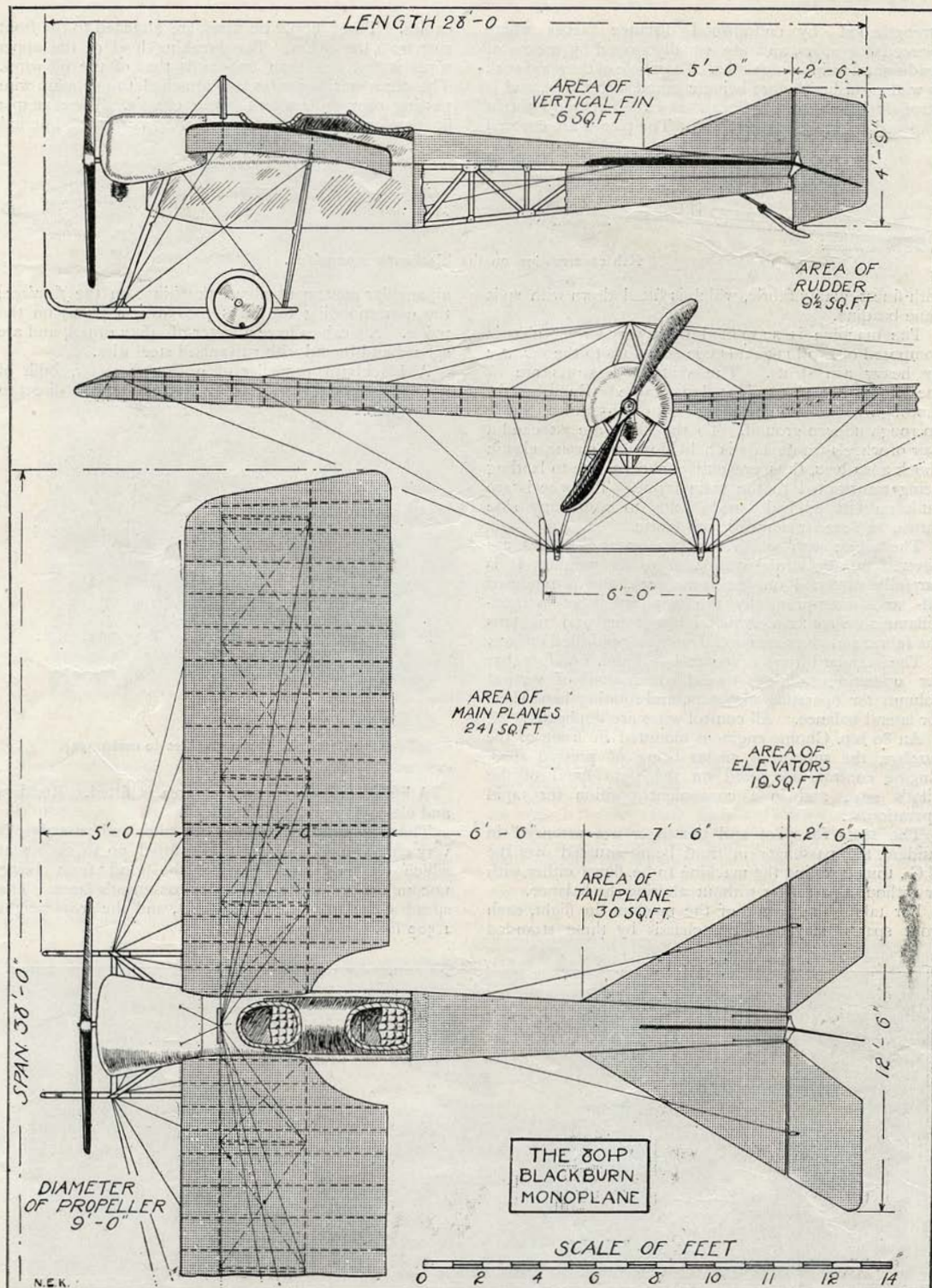
The Blackburn Type I

Against this exciting new Avro machine, Robert Blackburn decided to race a new Type I two-seat monoplane design. Of similar size to the Avro — 38ft (11.6m) span compared with the 504’s 36ft (10.9m), and 28ft 6in (8.7m) long compared with 29ft 5in (8.9m) — the Type I was also powered by one of the new 80 h.p. Gnome engines.

Flight published a description of the Type I in its December 27, 1913, issue:

“Constructionally, this new machine differs considerably from the older type, and is a distinct advance on anything hitherto turned out by the Blackburn firm. The fuselage is streamline in shape and triangular in section, and is built up in the form of a lattice girder. The front part is of English ash, and is covered with sheet aluminium, giving it additional strength and reducing the head resistance. The engine is covered over for about five-eighths of its circumference by a beaten-aluminium cowl, which is continued to form a scuttle dash [*the bodywork between the windscreen and the cowling*]. This effectively prevents the exhaust from the engine reaching either pilot or passenger.

“The mainplanes are rectangular in form,



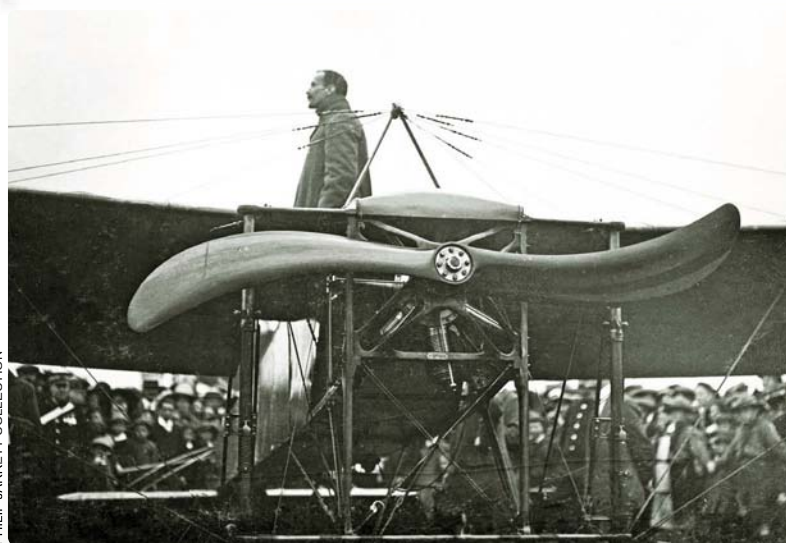
THE 80 H.P. BLACKBURN MONOPLANE—Plan, side and front elevations to scale.

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ABOVE A contemporary postcard showing the two contenders on the day of the race round Yorkshire on October 2, 1913. According to *Flight*, some 60,000 spectators turned up at Moortown to see the competitors off, despite the weather being less than ideal, with frequent bouts of mist causing problems throughout the day. VIA AUTHOR



LEFT French aviator Henri Salmet was on hand at Leeds with his two-seat Blériot XI-2 to provide entertainment — and pleasure flights for the more brave-hearted. Salmet had played a major part in Claude Grahame-White's "Wake Up England" aviation tour the previous year.

BELOW The Blackburn monoplane and Avro 504 prototype side by side, probably at Moortown before the start of the race. In July the following year Harold Blackburn used the same two-seater to open the first scheduled service in Britain, when he flew the first of his half-hourly single-passenger-carrying flights between Leeds and Bradford.

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VIA AUTHOR



VIA AUTHOR



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ABOVE LEFT Riding shotgun with Raynham in the Avro 504 was Humphrey Verdon Roe, younger brother of the company's founder, Alliot Verdon Roe. **ABOVE CENTRE** The photograph attached to Harold Blackburn's Royal Aero Club Certificate, No 79. **ABOVE RIGHT** Freddy Raynham, who began working for Avro as a test pilot in 1911.

and of a curvature designed to give maximum lift for a minimum drift [drag]. The main spars on which the ribs are built up are of the finest selected straight-grained English ash, the spars being machined out of the solid to the most efficient section, and not built up.

"The accommodation for both pilot and passenger is very comfortable, and a scuttle is fitted up to each seat which prevents the force of the wind from being uncomfortable on the pilot's and passenger's faces. The speed of the machine is 70 m.p.h. [113km/h], and the gross weight 1,500lb [680kg]."

The top speed of the Type I was probably about the same as the 504 prototype at the time of the prospective race.

Like the 504, the Type I was a developed design. Dr Malcolm Grahame Christie, a prominent member of the Yorkshire Aero Club, had enrolled in the Blackburn school in about September 1912 and purchased a Type B, similar to the type on which he was learning, in December. However, Christie's progress was very slow and it was October 1914 before he was to become a qualified pilot, being awarded Royal Aero Club Aviator's Certificate No 954 on the 27th of that month. In the meantime, Christie considered buying a two-seater and employing a pilot. Blackburn sold him a two-seater development of its Type D monoplane, as the Type I, and Christie's flying instructor, Harold Blackburn (no relation to the aircraft designer Robert Blackburn), was employed to pilot it.

Christie's Type I was delivered to the Yorkshire Aerodrome at Moortown, near the centre of Leeds, on August 14, 1913. He and Blackburn then made flights and attended events in Yorkshire, promoting aviation generally, and the Blackburn company in particular.

It was agreed that the 100-mile course would be circular and flown over Yorkshire. The initial take-off and final landing points would be at the Yorkshire Aerodrome, of which Christie was a director. The start and finish line was to be Holroyd's Intake on the main Leeds—Harrogate road. From there the aircraft would fly back over Moortown and towards York. The aircraft had to land at checkpoints at York, Doncaster, Sheffield and Barnsley. At each checkpoint the aircraft had to remain on the ground for 20min, presumably so the spectators had something to look at. A numbered "Special Aerial Issue" of the *Yorkshire Evening News* was to be published for the race. Each aircraft had to carry 50 copies, which were to be distributed at each checkpoint.

As both aircraft were two-seaters, it was decided that each would fly with a pilot and a passenger. The crew of the Blackburn monoplane consisted of Christie and Harold Blackburn. The Avro 504 would be flown by Avro test pilot F.P. "Freddy" Raynham, with Humphrey Verdon Roe as his passenger.

The race

On October 2, 1913, a large crowd gathered at the Yorkshire Aerodrome to see the start of the race. The French aviator Henri Salmét had been engaged to give exhibition and passenger flights in his two-seat Blériot XI-2 to entertain the crowd while the two teams completed their preparations. The race was planned to start just after 1400hr and both aircraft ascended together to pass the start line at 1414hr.

The pair were evenly matched on the flight towards York, with Raynham landing first 25min later, barely a minute ahead of Blackburn. The newspapers were duly unloaded, but the restart was slightly delayed when a small dog escaped

from the crowd. Both aircraft were airborne again by 1501hr.

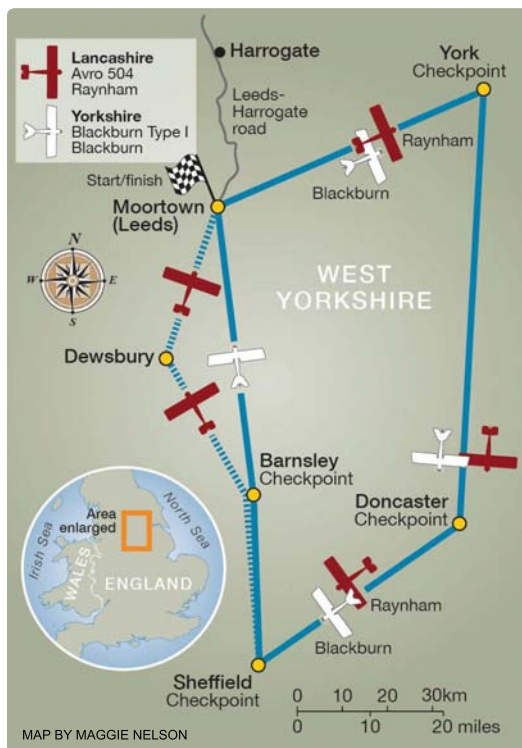
Flying towards Doncaster, the pilots began to encounter patches of mist. They landed together at Doncaster at 1533hr and took off again 18min later. Once more mist was encountered, and visibility was seriously reduced. This caused more problems for Raynham because he was unfamiliar with the area over which he was flying. By the time he reached Sheffield, Blackburn had begun to pull ahead and landed at 1620hr, 4min ahead of Raynham.

Blackburn took off from Sheffield at 1642hr, and landed at the Barnsley checkpoint 13min later. He took off again at 1719hr, by which time Raynham had still not arrived. In fact, the Avro had flown over Barnsley in the mist and landed by mistake at Dewsbury, 16 miles (25km) to the north-west. Realising their mistake, Raynham and Roe decided not to double-back and instead flew on to Leeds, where the Avro landed at 1730hr. Blackburn, having waited at Barnsley for 24min, arrived at Leeds at 1748hr.

The real winner?

The Yorkshire Evening News Challenge Trophy was awarded to the Yorkshire team, as the Lancashire team was disqualified for missing one of the checkpoints. Lancastrians claimed that Blackburn's local knowledge gave him an unfair advantage when attempting to identify landmarks in poor visibility conditions. Possibly this was the reason that it was agreed to repeat the event the following year, but this time over Lancashire. A Manchester—Blackpool—Liverpool—Manchester course was agreed, but the outbreak of the First World War intervened and the whole idea was dropped.

As far as the relative merits of the aircraft are



concerned, it must be recognised that the Type I was one of the last of Blackburn's monoplane designs. The 504 established Avro as a successful aircraft manufacturer, went on to see extensive service during the First World War and afterwards, and was still in production some 15 years later, with a total of more than 10,000 being built. Final proof of the ultimate superiority of the Avro 504 came in July 1914 — when one was purchased by Harold Blackburn!

BELOW Despite having beaten the Avro 504 prototype in the War of the Roses air race in a Blackburn monoplane, Harold Blackburn purchased one of the first production 504s, which is seen here on The Stray in Harrogate, with a view to establishing a "flying circus". The plan came to nothing, however, owing to the outbreak of the Great War.

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AQV: ITALY'S HIGH-ALTITUDE HOPE

In 1935 Italian aircraft designers began work on a series of fast high-altitude monoplanes aimed at recapturing the world altitude record. The AQV was the only one to fly, just before the war sidelined such records. **GREGORY ALEGI** traces the development and brief flying career of one of the few aircraft to be designed and built by the Regia Aeronautica

TODAY ALTITUDE is perhaps the least well-known of the world record categories that drove technical progress and national pride after the First World War. In the inter-war years, it was very different. During 1920–33 the *Fédération Aéronautique Internationale* (FAI) saw the limit pushed from 10,093m (33,114ft) to 13,661m (44,820ft) in nine records; four set by the USA, three by France and one each by Britain and Germany. *[Established in Paris in 1905, the FAI homologates official records using the metric system, hence our leading here with the same — Ed.]* The sheer physiological challenges of

breathing at high altitude and defeating freezing temperatures bestowed an aura of heroism on pilots who undertook such record flights.

The first Italian assault on the altitude record saw Renato Donati fly his Caproni Ca.113R biplane to 14,433m (47,352ft) on March 11, 1934, thus setting a new world record. Less than three months later, on June 1, the *Regia Aeronautica* (Royal Italian Air Force) created the *Reparto Alta Quota* (RAQ — High Altitude Unit), a counterpart to the *Reparto Alta Velocità* (RAV — High Speed Unit) created in 1928 to retake the Schneider Trophy.¹ Established at Montecelio, the airfield east of Rome home



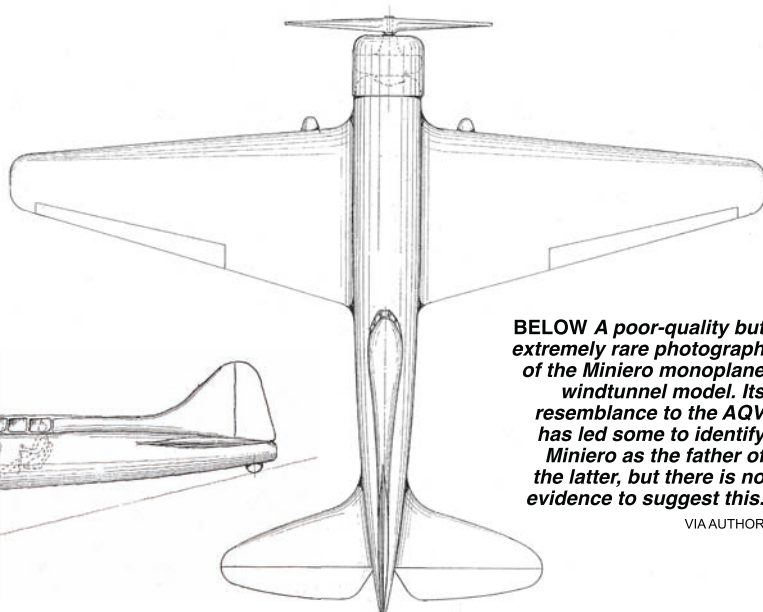
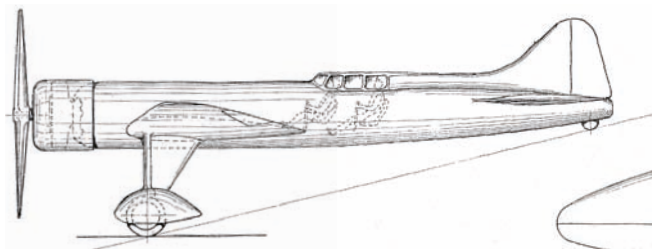
to the *Centro Sperimentale* (CS — Test Centre), the RAQ reported to the *Direzione Superiore degli Studi e delle Esperienze* (DSSE — High Directorate of Studies & Experimentation). By 1930 a substantial programme was under way at Montecelio to build a comprehensive research and test centre, to be named Guidonia in honour of Italian pioneer aviator and engineer Alessandro Guidoni. The RAQ was so closely entwined with the CS that its few pilots might, on paper, be assigned to the latter while serving with the former — or the other way around.

In January 1936 the RAQ had a mixed bag of aircraft on strength, including the record-setting

ABOVE A classic of the genre, Nello Voltolina's 1934 Futurist painting *Glorificazione della terra* ("Glorification of the Earth") celebrates the aeroplane as a symbol of progress and modernity, using abstract forms to evoke high-altitude flight, a popular aspiration in 1930s Italy. Ironically for one whose early career idealised the aeroplane, Voltolina (also known as Novo) was killed in a church during an air raid on Padua in March 1944.

OPPOSITE PAGE, TOP The sole AQV, serial MM.422, as built, with a faired fixed undercarriage. The AQV was the only aircraft designed by Giuseppe Schepisi, the majority of his career with the *Regia Aeronautica* being spent writing military aircraft design rules and specifications that remained in use for several decades. **ARTWORK BY RUGGERO CALÒ © 2017**

The earliest known Italian high-altitude monoplane proposal was the Caproni Ca.117, the original general arrangement drawing of which was rediscovered only during the research for this article, and the plan and profile views of which are reproduced here for the first time. VIA GIULIO C. VALDONIO



BELOW A poor-quality but extremely rare photograph of the Miniero monoplane windtunnel model. Its resemblance to the AQV has led some to identify Miniero as the father of the latter, but there is no evidence to suggest this.

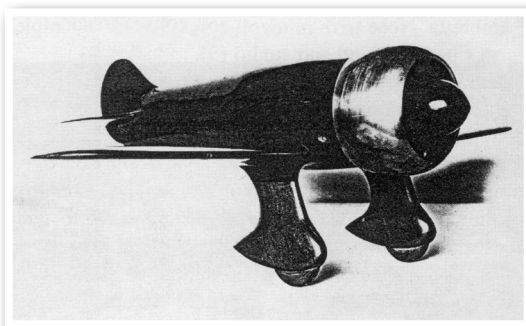
VIA AUTHOR

Ca.113R biplane and the rather more sedate Breda Ba.25 biplane trainer, Romeo (later IMAM) Ro.1bis biplane reconnaissance-bomber and Ro.30 reconnaissance biplane. The association between altitude records, the RAQ and Guidonia peaked with the AQV monoplane, developed, built and tested in this single location, which explains why it remained almost completely unknown until 1999, and its development and history grossly distorted thereafter.²

The high-flyers

By the mid-1930s open-cockpit biplanes were starting to give way to more advanced types. On September 28, 1936, Sqn Ldr F.R.D. Swain reached 15,229m (49,964ft) in the specially-constructed Bristol Type 138A, returning the record to Britain. Its monoplane design and enclosed cockpit pointed to the future, but it is difficult to say if, and to what extent, it influenced Italian designers. What is known is that during 1935–37 there appeared in Italy a series of at least three high-speed high-altitude monoplane designs, details of which have only recently surfaced, and of which the AQV was the only one to fly.

The first monoplane proposal was possibly the Ca.117, a 550 h.p. two-seater with a wing of 14.5m (47ft 7in) span and 30m² (323ft²) area. A general arrangement drawing was completed on September 13, 1936, but the type apparently never went any further. At some point *Capitano ingegnere* (Captain, engineering branch) Roberto Miniero proposed a 750 h.p. single-seater monoplane intended to reach a speed of 530km/h (329 m.p.h.) and a height of 13,600m (44,600ft). Various dates to 1935 or 1937, this unnamed design was built only as a



windtunnel model, the test results of which are unfortunately lost.³

The third monoplane was initially designated simply AQ (for *Alta Quota* — High Altitude), and was envisaged with an unspecified 500 h.p. engine with reduction gear. Its designer was Capitano ingegnere Giuseppe Schepisi, a young graduate engineer who had joined the service in June 1936, shortly after completing his doctorate.

The earliest surviving, albeit undated, AQ documentation provides a comprehensive list of static and aerodynamic tests, ranging from spinning to aileron and elevator balancing.⁴ It also shows Schepisi pondering alternatives, presumably to determine whether the potential performance gain justified the additional weight and complexity. With the engine set at 2,400 r.p.m. and the propeller turning at 1,890 r.p.m. at 10,000m (32,800ft), the aircraft was expected to be capable of 485km/h (301 m.p.h.) with a fixed undercarriage and 520km/h (323 m.p.h.) with a retracted undercarriage. Both metal and wooden empennages were contemplated, with the tailplane trimmable from -6° to +3°. Half of the



engine's torque would be balanced by clipping one wing by about 25cm (10in), a solution dating back at least to the 1917 Ansaldo SVA.

At the (unspecified) all-up weight, the centre of gravity (c.g.) of the variant with a fixed undercarriage and metal empennage would fall at about 26 per cent of the wing chord. The designation AQV (the V probably standing for *veloce*, or fast) first appeared on October 5, 1936, when drawing No 200918 stipulated a Piaggio P.XS engine, rated at 550 h.p. at ground level (450–550 h.p. at 10,000m/32,800ft), driving a three-bladed variable-pitch propeller weighing around 114–120kg (250–265lb).⁵

By February 23, 1937, the RAQ's aerodynamics department had built both partial and complete models, the drawings for which are the main source of technical data for this unique aircraft. The 1/4th-scale model drawings show a single-seat enclosed cockpit, possibly pressurised, and provide dimensions and design weight. They also show Schepisi still undecided on a choice of undercarriage — fixed with large fairings or retractable into underwing pods. The main model was tested at an airspeed of 43m/sec (96 m.p.h.) in the DSSE's Nos 2, 3 and 4 windtunnels. A smaller model, with appropriately distributed weight, was probably built for spinning tests.

After this series of preliminary tests, AQV activity came to a halt, probably because the Regia Aeronautica had decided to retake the altitude record with a lower-risk Ca.113 derivative. The Service had once again tapped Caproni, which in turn entrusted the project to *Generale ingegnere* Rodolfo Verduzio, who proposed two types, respectively powered by an Alfa Romeo 127S (the Ca.160, serial MM.353)

ABOVE This photograph of the main SCA hangar at Guidonia during the 1930s provides a snapshot of its production, overhaul and modification activities. The glider to the right is probably a Grifo, of which the SCA built six, beyond which is a 121^a Squadriglia Romeo Ro.30, a sole example of which was used by the RAQ.

and a Piaggio P.XIRC72 (Ca.161, serial MM.360). The biplanes were built so quickly that *Tenente Colonnello* Mario Pezzi was able to perform acceptance flights on February 4 and April 21, 1937 respectively, before their contracts were signed. The choice fell on the Ca.161, which Pezzi flew to 15,645m (51,329ft) on May 7, 1937, during only his fourth flight in the type.

Onwards and upwards

Little more than a month later Pezzi's 416m (1,365ft) gain was eclipsed by Flt Lt M.J. Adam, who reached 16,440m (53,937ft) in the Bristol Type 138A. Verduzio was asked to squeeze even more performance from the biplane, and Miniero was attached to the new record attempt, which saw MM.360 modified to "bis" standard.

Despite this, it was decided to proceed with the AQV as a pure research project. Construction was entrusted to the *Stabilimento Costruzioni Aeronautiche* (SCA — Aircraft Construction Establishment).⁶ Created in 1912 for lighter-than-air aircraft production, the SCA was located in Rome, within walking distance of the Vatican, and during the First World War had built some 60 airships, 400 observation balloons and 600 air-barrage balloons. After the Armistice, the SCA narrowly escaped privatisation. Under the leadership of Umberto Nobile, a former civilian SCA engineer who joined the new Regia Aeronautica as a *Tenente Colonnello*, it continued its airship activities, building, among



ABOVE & RIGHT Less than a handful of photographs of the completed A.Q.V. have been found, including this pair taken outside the hangar at Guidonia. Interestingly, the lettering beneath the tailplane reads "A.Q.V." with no full point after the "V". Could it be that the designation included the Roman numeral for "5", rather than a V for veloce? This remains speculation.

others, the famous *Norge* and *Italia* semi-rigids. The loss of the *Italia* in the Arctic in 1928 led to an inquiry that resulted in the decision to abandon airship use and construction in Italy. As a result, the much slimmed-down SCA moved to Guidonia and found a new role as an in-house experimental workshop reporting to the DSSE.

The subsequent loss of SCA records makes progress difficult to follow, but the A.Q.V. emerged from obscurity on June 16, 1939, when SCA director *Tenente Colonnello ingegnere* Luigi Bertagnolio reported to the ministerial High Altitude Sub-Committee that it would be ready for flight testing within six weeks.⁷ In the ensuing discussion the sub-committee acknowledged that the "not inconsiderable time" which had passed "between project definition and final construction" meant that the aircraft must be considered "overtaken by technical evolution". While a new world record was now out of the question, the sub-committee believed the A.Q.V. could still be used "for training and high-altitude experiments in support of the RAQ". It was also decided to evaluate the possibility of increasing range by adding fuel tanks, but progress remained slow.

When *Generale di Squadra Aerea* (Lt-Gen) Mario Bernasconi relinquished DSSE command



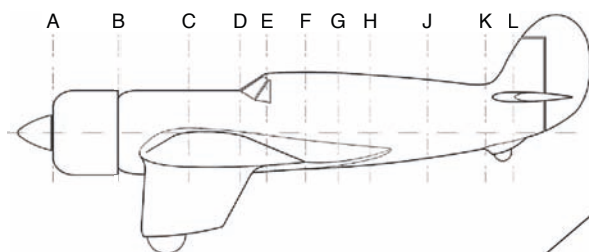
on December 1, 1939, his report to *Generale ispettore ingegnere* (Lt-Gen, engineering branch) Cristoforo Ferrari stated that the A.Q.V. prototype had "recently" completed static testing, leading to the decision to modify the tailplane with the addition of reinforcing struts. Shortly afterwards the A.Q.V. received military serial MM.422.

A change in direction

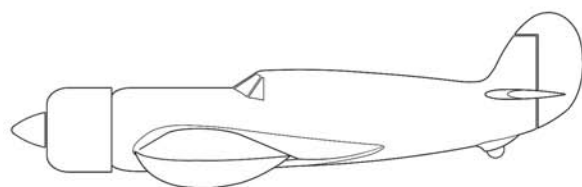
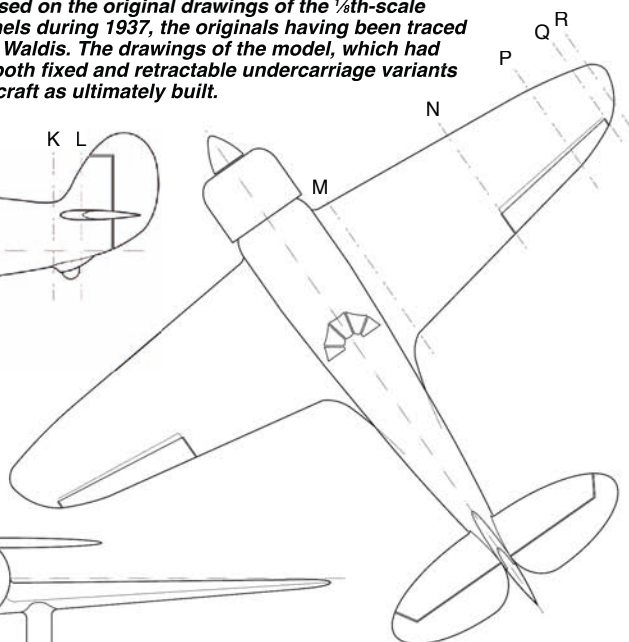
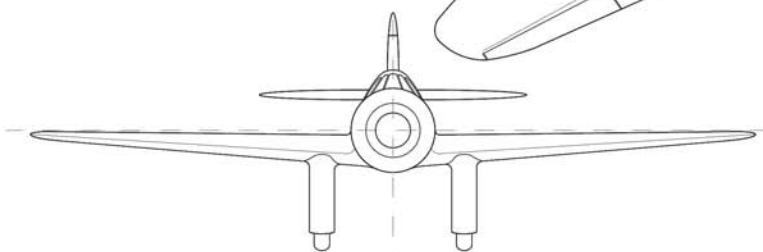
The Regia Aeronautica's interest in high-altitude flight had by then shifted towards the development of a stratospheric bomber, so much so that when the industry proved sceptical about the design competition, the Service considered options ranging from purchasing a Lockheed XC-35 (a pressurised development of the Lockheed 10 Electra) to instructing SCA to build the DSSE-designed "Guidonia I" trimotor.⁸ To this end, it was apparently proposed to fit the A.Q.V. with a "dynamic high-lift system" developed at Guidonia, consisting of what appears to be an active boundary-layer control

Regia Aeronautica Aqv Artwork by Angelo Brioschi

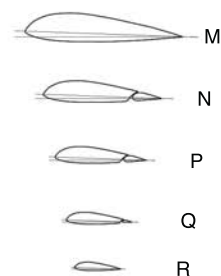
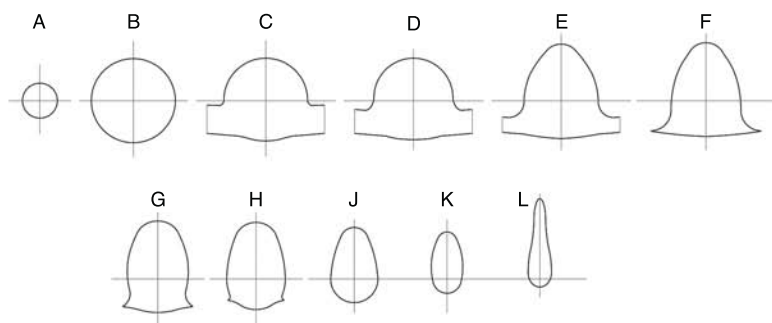
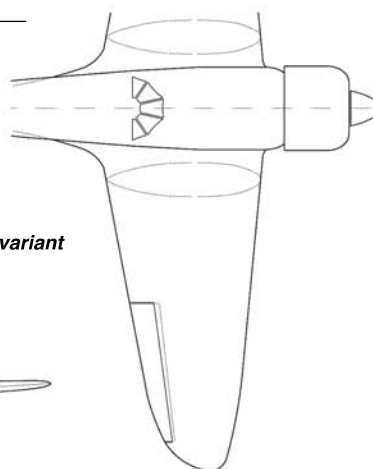
The scale drawings presented below are based on the original drawings of the 1/10th-scale Aqv model tested in the Guidonia windtunnels during 1937, the originals having been traced by the late Angelo Brioschi, courtesy Paolo Waldis. The drawings of the model, which had a fuselage length of 93.8cm (3ft 1in), show both fixed and retractable undercarriage variants and exhibit marked differences from the aircraft as ultimately built.



Fixed-undercarriage variant



Retractable-undercarriage variant





LEFT The pilots of the RAQ pose beside the Caproni Ca.161. Capitano Aldo Oddono, second from left, was the only pilot to fly the AQV. Other members of the group include Maggiore Tomaso Lomonaco, the doctor who oversaw the physiological aspects of the high-altitude programme (third from left) and pilots Tenente Colonello Mario Pezzi (second from right) and Maggiore Nicola Di Mauro (furthest right).

BELOW A rear view of the AQV at Guidonia, showing the aircraft's distinctive wing markings. It appears that the aircraft was built with equal-span wings, rather than having one wing clipped to counteract engine torque.

system, in which air was sucked in through the upper wing surface and blown out elsewhere.⁹

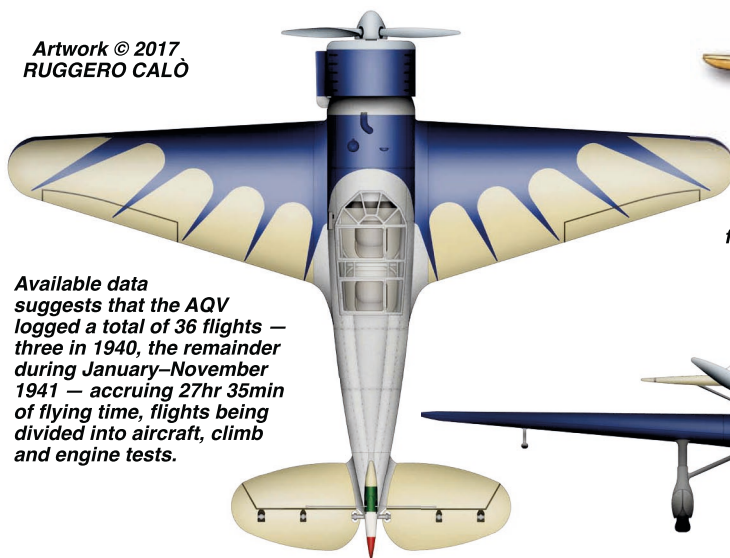
The idea was not pursued, however, and eventually the RAQ received the AQV in a two-seat configuration with a fixed undercarriage with simplified fairings. At the time, the unit comprised only four pilots. The choice fell on Capitano Aldo Oddono, a 28-year-old decorated veteran of the 1935–36 Second Italo-Ethiopian War, who had joined the RAQ on October 22, 1938, after brief spells with the Regia Aeronautica's 53^o and 50^o *Stormo* (Wings). Although he lacked specific altitude or testing experience, Oddono had received the highest marks for flying skill. "Nobody knew what the aircraft was", Oddono recalled when interviewed in the 1990s, adding that he had been selected because Pezzi was serving in Albania and Di Mauro was working on another seaplane altitude record. "At Guidonia everyone was very protective of their work, and 'kept mum'".

On June 10, 1940, the Italian leader, Benito Mussolini, declared war on France and Britain. On July 6, Oddono made the short and

uneventful maiden flight of the AQV. "Because I was a Service pilot testing a Service-built aircraft," Oddono complained, "I was not paid the handsome first-flight bonuses which company pilots received". He also added that the AQV was pleasant to fly and that he had been its only pilot, which the author can confirm through the logbooks of RAQ pilots Pezzi, Maggiore Nicola Di Mauro and Capitano Paolo Moci (who stated categorically in 1992 that he was assigned to the CS at the time).¹⁰

On the second flight of the AQV, on July 30, Oddono carried its designer, Schepisi, as a passenger, the only person recorded as such during the aircraft's career. Confirming the overall lack of official interest, the third test flight was not made until December 18. To put the RAQ's aircraft to good use, it was suggested that they be fitted with cameras for reconnaissance duties over Malta. At least one Ca.113R was so equipped, and Oddono flew several photographic test sorties over Rome, including one at 13,000m (42,600ft). "We could see three seas from there," he recalled, "and





Available data suggests that the AQV logged a total of 36 flights — three in 1940, the remainder during January–November 1941 — accruing 27hr 35min of flying time, flights being divided into aircraft, climb and engine tests.



ABOVE The Regia Aeronautica awarded special wings adorned with an "S" to pilots who achieved flights of 12,000m (39,400ft) and higher; probably only a mere handful of pilots ever earned the right to wear them.

VIA AUTHOR



because we flew in the stratosphere, we drew double flight pay!"

The AQV was never fitted with cameras, however, and continued its limited flying programme throughout 1941, reaching 8,000m (26,247ft) — its highest altitude — on September 25. When Oddono was given command of a *squadriglia* in Albania, the AQV stopped flying, its last flight taking place on November 7, 1941.

Lost and found

The RAQ was finally disbanded on July 25, 1942, but its aircraft lingered on. A comprehensive list of aircraft withdrawn from use as surplus to requirements or no longer suited for their original purpose shows that on June 5, 1943, the AQV was still at Guidonia, together with a Ca.137, Ca.160, Ca.161 and several engines. A memo addressed to the head of the CS, *Generale di brigata aerea* (Brigadier General) Guglielmo Cassinelli, suggests scrapping a Caproni and asks what to do with the AQV. Although no decision is recorded, no RAQ aircraft appear in a German list of aircraft seized at Guidonia after the Italian armistice of September 1943, nor were their wrecks found by the Allies in June 1944.

Although Oddono remained in the Italian Air Force until the late 1950s and Schepisi until the mid-1960s, memory of the AQV soon faded. In 1975 the aircraft was omitted from the first published list of Italian serials compiled by the Italian Aviation Research Branch of Air-Britain (IARB), which listed MM.422 as "type unknown". More than a decade later the author discovered the "SCA Guidonia AQV" in a forgotten ledger in the ITAF Historical Office, and in the early 1990s the late Baldassare Catalanotto matched the name to hitherto unidentified photographs in his collection. The AQV had returned to take its albeit minor place in Italian aviation history.



Endnote references

- 1 Archivio Ufficio Storico dello Stato Maggiore Aeronautica (AUSSMA), RAQ unit history and Forms A and B.
- 2 Gregory Alegi, article "Alla caccia dell'AQV", *Aerofan* No 71 (1999). The skeletal AQV entry on the Italian-language Wikipedia website presents numerous factual errors, possibly owing to its exclusive reliance on a later commercial publication rather than primary sources.
- 3 Bernardino Lattanzi, *Vita ignorata del Centro Studi ed Esperienze di Guidonia*, Roma, IBN, 1990. pp11, 158.
- 4 AUSSMA, SIOS collection, boxes 18 and 258
- 5 In the Italian designation system, the "S" indicated a port-turning propeller, but no such P.X variant is known. Surprisingly, in this case the more appropriate suffixes "R" (reduction gear) and "C" (supercharged) were not applied.
- 6 Giulio Costanzi, "L'apporto italiano allo sviluppo della Tecnica Aeronautica", *Rivista Aeronautica*, March 1959, pp544–546. Again, Wikipedia misrepresents SCA as "Società" (company or firm) rather than Stabilimento (Establishment).
- 7 Minutes of June 16, 1939, meeting in Archivio Centrale dello Stato (ACS), Ministero Aeronautica (MA), Gabinetto (GAb), 1939, f. 2.1.9.
- 8 Giancarlo Garelli, "Guidonia I. Un trimotore da bombardamento per il concorso del 1938", *Aerofan* No 4 (1983).
- 9 Gianni Gambarini and Andrea Curami, *Catalogo delle "Matricole Militari" della Regia Aeronautica (1923–1943)*, unpublished typescript, 1992, p83.
- 10 The logbooks for Pezzi, Di Mauro and Oddono are in AUSSMA; Paolo Moci kindly granted access to his personal logbook.

ACKNOWLEDGMENTS The author would like to thank Gianandrea Bussi, Gianni Cattaneo, Giulio C. Valdonio, Paolo Waldis, the late test pilots Aldo Oddono, Adriano Mantelli and Paolo Moci and the late designer Ermanno Bazzocchi for their invaluable research and assistance during the preparation of this article

EUROPEAN AIRLINES 10 YEARS



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OPERATION BOLO & PROJECT SILVER DAWN

In January 1967 the USAF undertook its most intensive MiG-hunt of the Vietnam War. Well-known as a masterpiece of American tactical skill and leadership, Operation *Bolo* has never been explored from both the USAF and Vietnamese perspectives, or in terms of the vital secret role played by the recently declassified *Silver Dawn* project. **ALBERT GRANDOLINI** takes a look at the full story for the first time



IN A CONFLICT in which close air combats were relatively sporadic, the USAF's Operation *Bolo* is one of the better-known examples of the Vietnam War, and is celebrated in the USA as an object lesson in tactical innovation, technological superiority and leadership, rewarded with success. It was to be a fragile success, however, for in the following weeks the MiGs of the *Khong Quan Nhan Dan Viet Nam* (Vietnam People's Air Force — VPAF) made an aggressive return to the fray, overcoming their difficulties by devising new tactics. *Bolo* also highlighted the difference between two opposing conceptions of how to fight an air war.

The USA initially anticipated a swift conclusion to the conflict by unleashing the entire might of its air power against its third-world adversary. America's air arms quickly found this strategy frustrated, however, and were forced by their leadership into a gradual, cautious and costly protracted campaign aimed at denying North Vietnamese support to the communist insurgents in the south. The USA found itself on a collision course with China as early as the start of Operation *Rolling Thunder*, the air campaign against North Vietnam, in March 1965. Beijing sent several anti-aircraft artillery (AAA) divisions to bolster the fledgling North Vietnamese air-defence system, with Chinese troops donning North Vietnamese military uniforms.

To their alarm, the Americans also found themselves facing surface-to-air missiles (SAMs) operated by Soviet technicians, as American signals intelligence (SIGINT) intercepts would reveal. All was in place for a replay of the Korean conflict, in which the USA had not only faced the Korean People's Army Air Force, but also entire Soviet and Chinese air divisions. Less than three years after the Berlin and Cuban missile crises, the probability of a global — and possibly nuclear — conflict, at least with China, had to be taken seriously by President Lyndon B. Johnson.

GUERRILLA AIR WARFARE

It was within this context that North Vietnam invested a substantial part of its economic and military resources in setting up an integrated air-defence system which, once completed, would replace the Chinese units. The initial plan was to cover main urban centres like Hanoi and Haiphong, as well as some industrial sites such as the Thai Nguyen steel mill and the coalmines at Hong Gai and Cam Pha.

A second phase would see the system expanded to cover the whole of North Vietnam, particularly



the vital logistic routes that channelled men and equipment towards South Vietnam. With limited resources, not least in educated and qualified personnel, North Vietnam was forced to restrict the development of the VPAF, instead devising an original doctrine in which air power was seen only as an adjunct to its ground-based air-defence assets. Deploying only two fighter regiments of MiG-17s (Nato reporting name *Fresco*) and MiG-21s (*Fishbed*), a total of around 100 fighters, the VPAF had no illusions about its ability to secure air superiority against 1,500 American combat aircraft. The main task of its interceptors would be to harass and disperse American attack formations, making the latter more vulnerable to SAM and AAA units as part of a "guerrilla air warfare" strategy. If, by making firing passes, the VPAF's fighters could succeed in forcing the American fighter-bombers to release their bombs before reaching their intended targets, the mission could be deemed a success. The ability of the VPAF's inexperienced pilots to create such a nuisance grew over the months, despite heavy losses, forcing American pilots to recognise the courage and determination of their opponents.

By the end of 1966 the American air campaign was gaining momentum, but it seemed to have no tangible effect on the Hanoi leadership and its determination to continue the war. Receiving foreign journalists, Chairman Ho Chi Minh reaffirmed his determination to continue the struggle for "ten, 20 or even 30 more years, for

OPPOSITE PAGE Colonel Robin Olds, CO of the 8th Tactical Fighter Wing and mastermind behind Operation *Bolo*, is lifted aloft by members of his unit on the occasion of the completion of his last combat mission over Vietnam in September 1967. **TOP** A haggard President Johnson (left) confers with his team over a model of Khe Sanh in 1968.



ABOVE *The USA's Secretary of Defense, Robert S. McNamara, in 1967. An accountant by training and temperament, McNamara was one of the prime architects of the USA's policy in Vietnam and based his strategy on a statistical approach, i.e. "they will run out of soldiers before we do".*

the total reunification of the country", a task presented to his people as a national crusade.

In the USA the Pentagon set about reorganising its air tactics. From the first intermittent strikes undertaken during the second half of 1964, the attacks evolved into a sustained and continuous day and night campaign. In April 1966 North Vietnam was divided by the Americans into tactical Route Packages (RPs), which delineated the operational areas of the USAF and US Navy. The latter was tasked with operations over RP-II, RP-III, RP-IV and RP-VIB, which covered the North Vietnamese coastal zones, including Haiphong and the eastern part of the Red River Delta areas. The USAF was to operate over RP-I, just north of the Demilitarized Zone (DMZ) separating the two Vietnams; RP-V, covering the western part of North Vietnam, and importantly, RP-VIA, which included the well-defended Hanoi area. In addition, two specially restricted zones were put in place over the strategic harbour of Haiphong and the North Vietnamese capital. Strikes inside these zones required authorisation from the highest American authorities. Finally, a 9–12-mile (15–19km) no-fly zone was imposed along the Chinese border after several accidental crossings into Chinese airspace.

The USA's strategy combined air attacks with secret diplomatic missions to convince the Hanoi leadership of the futility of its war aims, as a prelude to imposing on it, by force if necessary, an accord that guaranteed the survival of a non-communist South Vietnam. Furthermore, the

purpose of the air campaign was to demonstrate to the North Vietnamese that the more they attacked in the south, the more they would be exposed to greater destruction in the north.

One of the most significant escalations of the American air offensive was the series of attacks undertaken against petrol, oil and lubricant (POL) depots throughout the country, along with the bombing of storage areas, railway stations and bridges in the Hanoi and Haiphong areas in June 1966. However, after two years of incessant American air strikes, many military and civilian leaders in Washington DC began to doubt the efficacy of the policy. Indeed, it was difficult to evaluate the impact of these strikes on the reduction of the military and economic capacities of North Vietnam, a country that imported most of its goods from its communist allies. The same could be concluded about the impact of the continuous air attacks on the morale of its population, which was completely organised and mobilised by a totalitarian state system.

Nevertheless, the USA's Secretary of Defence, Robert S. McNamara, one of the staunchest supporters of the air offensive in Vietnam, persisted with his strategy in the strong belief that Hanoi was on the brink of total collapse. McNamara had created a complex evaluating system to assess the effectiveness of the campaign, using the number of sorties flown and targets attacked each week, as well as the tonnage of bombs dropped, as a metric. However, using such statistics as a basis for a coherent airpower

The Vietnam People's Air Force received its first Mikoyan-Gurevich MiG-21F Fishbed-Cs in November 1965. This example of the 921st Fighter Regiment is seen at Noi Bai armed with a pair of Soviet-designed R-3S (AA-2 Atoll) infrared short-range air-to-air missiles, essentially a reverse-engineered version of the American AIM-9 Sidewinder.

ALBERT GRANDOLINI COLLECTION



strategy did not necessarily bring about the desired results.

The most tangible result of the air campaign up to that point was the increasing effectiveness of the North Vietnamese air-defence system, which by this time was enjoying greatly improved co-ordination between MiG and SAM/AAA operations. The VPAF began to deploy its first MiG-21Fs (Nato reporting name *Fishbed-C*) in November 1965 — with more advanced MiG-21PF *Fishbed-Ds* arriving in April 1966 — in a new fighter regiment manned by 33 pilots under the command of Maj Tran Manh, with Capt Dinh Ton as Operations Officer. The decision to set up the new unit had been taken in the spring of 1965, when 12 MiG-17 pilots and 24 newly graduated cadets were sent to Krasnodar in the southern Soviet Union for conversion to the MiG-21. Three of the pilots were “washed out”, however, and were reassigned to the MiG-17.

ENTER THE FISHBED

The unit chosen to operate the new supersonic fighter was the 921st Fighter Regiment (FR), named *Sao Do* (Red Star), the first and at that time only VPAF fighter unit, which transferred its MiG-17s to the newly created 923rd FR. Only a small cadre of experienced personnel stayed with the 921st FR to help with conversion on to the MiG-21. The VPAF's fighter force commander, Lt-Col Dao Dinh Luyen, thoroughly trained his men on the new aircraft and set about devising suitable tactics for using it. Owing to the inexperience



The commander of the VPAF in January 1967 was Lt-Col Dao Dinh Luyen, a former infantry officer and one of the first North Vietnamese fighter pilots to be trained in China in the late 1950s.

ALBERT GRANDOLINI COLLECTION

of most of his pilots, he wisely decided to begin with a period of “on the job” training, simulating attacks on American formations and assessing their results. Accordingly, American airmen began to report sighting elusive MiG-21s making passes but breaking off quickly, as if they were on a training cycle, trying to improve their technique.

The next stage was to attack Ryan Firebee drones used for surveillance and as SAM-bait, and attempts were also made to intercept high-flying Lockheed U-2s. These tactics seemed desultory at first, but the Americans were expecting the North Vietnamese MiG-21s to engage soon, and took such a threat very seriously.

The type's first combat occurred on April 26, 1966, when a USAF McDonnell Douglas F-4 Phantom II shot down a VPAF MiG-21. Initially, the VPAF combined mixed formations of MiG-17s and MiG-21s in low-level dogfights with haphazard results, the American fighters usually having the upper hand. The MiG-21 proved to



ABOVE The McDonnell Douglas F-4 Phantom II formed the backbone of the USAF's fighter units at the beginning of the Vietnam conflict. They were, however, also used in numbers for the ground-attack role in addition to the Republic F-105s. This F-4D of the 435th TFS, 8th TFW, refuels before heading north on a bombing mission in 1968.

be a poor dogfighter, owing to a restricted field of vision for the pilot, especially to the rear and below the nose. As a result, the MiG-21 pilots were ordered to disengage as soon as they found themselves in a disadvantageous position. Several aircraft were lost after running out of fuel while trying to outrun the American fighters patrolling over their bases or along the Chinese border, cutting off all potential escape routes.

An important issue for the VPAF was the close co-ordination required between the Ground Control Interception (GCI) officer and the pilots who relied on him for target guidance, a serious problem being the limited avionics of the MiG-21. The MiG-21PF's RP-21 Sapfir radar had a practical detection range of only 4–8 miles (7–13km), while the MiG-21F had only a radar rangefinder, making both variants completely dependent on ground control for target vectoring. By comparison, the F-4C's AN/APQ-100 radar had a detection range of around 37 miles (60km).

The MiG-21's weapons system was also very limited, comprising two R-3S (Nato reporting name AA-2 *Atoll*) infrared guided missiles (the MiG-21F had an additional Nudelmann-Rikhter NR-30 30mm autocannon). A copy of the AIM-9B Sidewinder that equipped the Phantoms, the R-3S suffered from the same weakness, namely a narrow acquisition cone from the rear of the target for its infrared homing system. During one early engagement, a flight of MiG-21s expended no fewer than six *Atolls* against a group of USAF Republic F-105 Thunderchiefs without scoring a single hit. The North Vietnamese tried to alleviate the problem by deploying mixed formations, the leading MiG-21 being armed with two R-3S missiles while his wingman carried two

pods of R-5M air-to-air rockets. The latter's task was to finish off the target with a salvo of rockets, but the results were mixed at best. Nevertheless, the VPAF claimed at least three kills with the unguided rockets, downing an F-105 on June 7, 1966, and two F-4s on September 9 the same year.

The MiG-21s became more aggressive during the summer of 1966, claiming two F-105s in July against two *Fishbeds* shot down by Phantoms. By the autumn the VPAF had begun to launch co-ordinated attacks with MiG-17s and MiG-21s, maintaining combat air patrols (CAPs) along the enemy's main approach routes to the Hanoi area. The incoming American fighter-bomber formations were initially engaged by SAMs before being disrupted and forced into low-level dogfights with MiG-17s at low level. The MiG-21s would then pounce on the rear of the American formations, trying to pick off isolated flights or aircraft by making supersonic passes and firing their *Atolls* at a distance of 5,000–6,500ft (1,500–2,000m). The MiG-21s would then dive to low altitude, where the radars of the Phantoms could not pick them up.

In December 1966 the MiG-21s began to expand their operating zone beyond the Red River Delta area in the heart of North Vietnam. They now operated from four bases, the main base being Noi Bai (Phuc Yen for the Americans), north-west of Hanoi, with detachments at Gia Lam in the suburbs of the North Vietnamese capital, Cat Bi near Haiphong and Kep, north-east of the Red River Delta.

Encounters with MiGs intensified considerably in September 1966, some 37 combats taking place, 25 of which were against F-105s. The strength of the two VPAF fighter regiments was



ABOVE The F-105D undertook the lion's share of Rolling Thunder missions against North Vietnam, the type being able to carry an impressive bomb package, but lacking the agility of the Phantom. This example wears the "JJ" tailcodes of the 34th TFS, based at Korat in Thailand, and carries an AN/ALQ-71 ECM pod on its outboard pylon.

increased by 60 per cent with the arrival of newly graduated pilots returning from training in the Soviet Union, and air combats became a daily occurrence during October–December. Nearly a quarter of the Thunderchiefs delivering attacks in the RP-VIA area aborted their missions and were forced to drop their bombs off-target when intercepted. Most of the effort was undertaken by the MiG-17s but the MiG-21s also increased their attacks, claiming some 13 kills during September–December. (The Americans, however, acknowledged only three aircraft destroyed and two probables due to the *Fishbeds*.)

During the same period, the MiG-21s made efforts to bring down Douglas EB-66 Destroyer electronic countermeasures (ECM) aircraft tasked with jamming North Vietnamese radar and radio communications. Although the MiG-21s were not successful — these precious assets were zealously guarded by a barrier of Phantoms — the USAF was forced to move its jamming orbits further back, decreasing their efficiency.

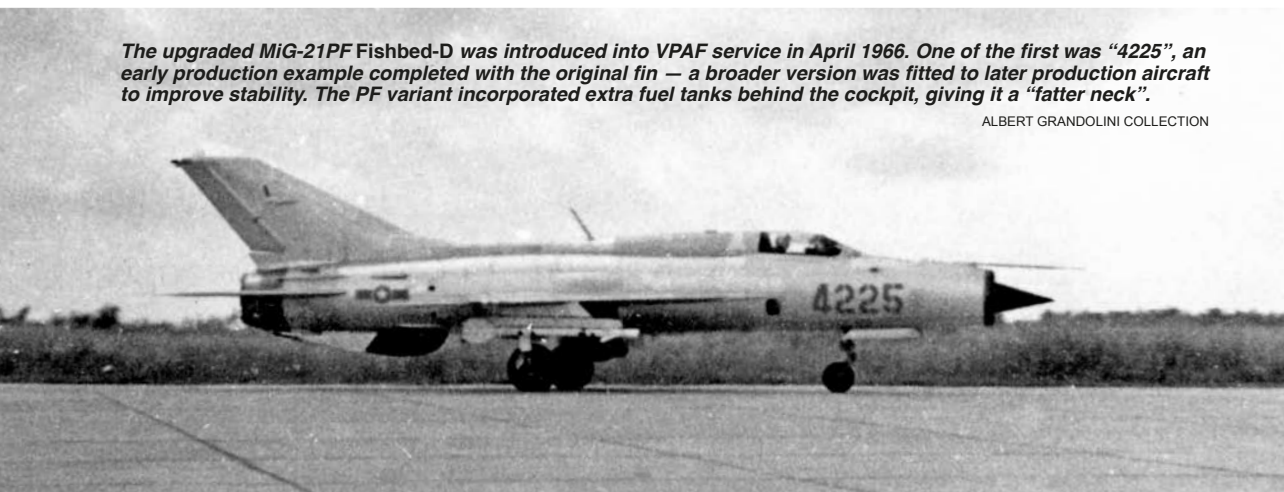
Various American and South Vietnamese air units participated in strikes against North Vietnam, but the main effort was undertaken by the two USAF Wings of Thunderchiefs based in Thailand and two Wings of F-4 Phantoms, the latter comprising the 366th Tactical Fighter Wing (TFW) at Da Nang, South Vietnam, and the 8th TFW "Wolf Pack" at Ubon, Thailand. The 8th was also assigned escort duties for the fighter-bombers, which meant gaining and maintaining air superiority over North Vietnam. However, the unit was becoming increasingly distracted from this important task because of a growing demand for bombing missions.

SETTING THE TRAP

To sustain the increasing mission rate required by the Pentagon, it was decided that the 8th TFW should be engaged on night-attack missions as part of Operation *Rapid Roger*. Up to this point, night operations had been assigned to specialised USAF Martin B-57 and US Navy Grumman A-6

The upgraded MiG-21PF Fishbed-D was introduced into VPAF service in April 1966. One of the first was "4225", an early production example completed with the original fin — a broader version was fitted to later production aircraft to improve stability. The PF variant incorporated extra fuel tanks behind the cockpit, giving it a "fatter neck".

ALBERT GRANDOLINI COLLECTION



Wearing the "FO" tailcodes of the 435th TFS, a pair of F-4Ds heads out for a bombing mission in North Vietnam. By the end of 1966 most of the 8th TFW's Phantoms were engaged on ground-attack missions.



JAMES WOOD VIA WARREN THOMPSON

Intruder units. With no additional resources, the 8th TFW was forced to undertake a high number of missions for several weeks, ultimately bringing it to the verge of collapse. The pilots, living in primitive conditions, alternated day and night missions without proper recuperation time, their mechanics working to the point of exhaustion and sleeping when possible in the hangars.

The Seventh Air Force, which ran the air war in South-east Asia, fired the Wing's overzealous CO, Col Joseph Wilson, as a scapegoat. He was replaced on September 30, 1966, by Col Robin Olds (**RIGHT**), a Second World War ace with 12 kills, well known for his independence of mind and for leading his men by example. His previous assignment had been as CO of the 81st TFW at RAF Bentwaters in the UK, a unit equipped with McDonnell F-101C Voodoos specialised for the nuclear strike role beyond the Iron Curtain.

After converting on to the Phantom in the USA, Olds arrived in Thailand to find a demoralised Wing which had lost ten F-4Cs in less than two months over North Vietnam. Characteristically, Olds went into action immediately, flying as many missions as possible, particularly the most difficult, to evaluate the unit's working conditions and tactics and to assess his new team. During his one-year tour, Olds flew some 152 sorties, many over the dangerous Hanoi area, as against his predecessor's total of 12. The new CO suspended all nocturnal sorties and placed MiG-hunting at the heart of his Wing's activities.

Olds quickly realised that most of his young pilots had not yet accrued the fundamentals of air combat or become versed in the art of dogfighting. Citing great progress in the development of radar and air-to-air missile technologies, the USAF had reduced the close-combat element of its training syllabus. The time dedicated to such training had been reduced to around ten per cent of what it



USAF

had been a decade previously. The emphasis was now on the interception of enemy aircraft beyond visual range (BVR) with AIM-7D/E Sparrow radar-guided missiles. However, like the short-range infrared-guided Sidewinder, the Sparrow's reliability in combat proved disappointing.

Olds set about honing the skills of his men, and arranged training sessions with the RAAF's resident No 77 Sqn, the latter's CAC Sabre Mk 32s playing the role of enemy MiG-17s. After several weeks of practising, the Wolf Pack became one of the few units in theatre, along with some US Navy Vought F-8 Crusader squadrons, that could be considered truly proficient in air combat. With his pilots' morale restored, Olds began a campaign to obtain permission for a major MiG-hunt.

POLITICAL CONSIDERATIONS

Since the beginning of Operation Rolling Thunder, the Americans had envisaged destroying the VPAF at its bases. However, a reluctance to risk casual-



Four pilots of the 923rd FR walk along a line of the unit's MiG-17s before a mission in 1967. From left: Luy Huy Chao (six kills), Le Hai (seven), Mai Duc Tai (two) and Hoang Van Ky (five — KIA on June 5, 1967).

ties among the Soviet and Chinese advisors on the bases precluded this scheme. To the great frustration of the American pilots, the Pentagon chose not to react when a group of North Korean pilots became involved, flying VPAF MiGs. The US Government's fear was that, once the VPAF had been eliminated, China might send its air force into North Vietnam as part of a new phase of escalation. Indeed, a clause in the secret military accord signed between Hanoi and Peking in February 1964 had explicitly envisaged the deployment of Chinese air units to North Vietnam in the case of hostilities with the USA. However, despite North Vietnam's repeated requests, the Chinese government deferred its obligation in a gesture of appeasement.¹ The only way to destroy the MiGs would be to entice them into combat.

The most recent reports indicated that the MiGs prioritised the F-105s, which had become less manoeuvrable since being equipped with newly deployed AN/ALQ-71 (QRC-160) ECM pods to jam the radars of the SAMs. The "Thuds" were forced to fly rigid four-aircraft formations to maximise their electronic jamming capability, substantially increasing their vulnerability. Olds devised a plan to make his agile Phantoms look like cumbersome bomb-laden F-105s, in order to lure the MiG-21s into a dogfight. A similar

trick had been used on July 4, 1965, when four F-4Cs enticed four MiG-17s to attack them, the Phantoms shooting down two of the *Frescos*. Olds envisioned a far more ambitious plan to catch as many of the elusive MiG-21s as possible.

Olds gathered a small planning team around his Operations Officer, Capt John B. Stone, including Maj James D. Covington, Capt Ralph Wetterhahn and Lt Joe Hicks. It appeared that the North Vietnamese GCI stations had an advantage in being able to vector their interceptors undetected at low level towards the American formations, the interceptors then popping up to make a surprise firing pass. At this point, American radar stations in South Vietnam, Thailand and aboard US Navy ships did not have the required range to cover the strategic Red River Delta area. The USAF's Lockheed EC-121D Warning Star early-warning aircraft could not detect the MiGs below 10,000ft (3,000m), and, when the latter were higher, the EC-121Ds could not ascertain an exact altitude.

SILVER DAWN

Olds, however, learnt that the National Security Agency (NSA) was eavesdropping on North Vietnamese radio communications as part of the top secret Project *Silver Dawn*, using specially

MiG-21PF "4228" was one of the seven shot down during Operation Bolo, the pilot, Vu Ngoc Dinh, ejecting safely. The aircraft is seen here with a typical armament load of an R-3S (AA-2 Atoll) air-to-air missile on each wing and a 490lit (107 Imp gal) PTB-490 centreline fuel tank. Artwork by TOM COOPER © 2017



A pair of Lockheed C-130B-IIs similar to this example were employed for the first and only time in a tactical role during Operation Bolo. The 6988th Security Squadron crew (or "Bats" as they were known) comprised linguists and translators who eavesdropped on orders issued by the VPAF controllers and passed the information on to the USAF pilots. USAF



configured Lockheed C-130B-IIs of the USAF Security Service's 6988th Security Squadron. The unit's operators were able to detect when a North Vietnamese take-off order had been given, when the MiG pilots had American aircraft in sight and when they were ordered to attack; invaluable information for the Phantom pilots — if they could access it. Olds was told, however, that the NSA would not potentially compromise its intelligence operations for purely tactical considerations. Nevertheless, he persisted and was finally authorised to include the use of the C-130B-IIs for his plans.

The next challenge for Olds would be the installation of ECM pods on the F-4Cs to simulate the electronic signature of the F-105s. After drafting an outline of his plan, he flew to Baguio in the Philippines, where a General Staff conference was being held. Once there, Olds went directly to see the commander of the Seventh Air Force, Gen William W. Momyer, but without success. Olds continued to plead his case up the ladder of command until the idea began to arouse interest. Finally, on December 22, 1966, his plan was approved and christened Operation *Bolo*.² Olds was granted the required support and could borrow the ECM pods for one week.

Bolo would be the biggest MiG-hunt to date, and would involve the deployment of two main Phantom forces. First, a formation of 20 Da Nang-based F-4Cs of the 366th TFW would penetrate North Vietnam from the Gulf of Tonkin to cover the eastern part of the Red River Valley and Kep airbase, and act as a barrage along the Chinese border in order to prevent VPAF MiGs escaping across it. The main striking force would comprise 28 Ubon-based 8th TFW F-4Cs, which would cross into North Vietnam from Laos and head directly into the Hanoi area. These would entice the MiGs to come up by masquerading as a formation of lumbering F-105Ds, the Phantoms carrying the same ECM pods. A third force of 24 F-105D/Fs would clear the way for the Phantoms

by attacking SAM sites around the main VPAF bases at Kep, Cat Bi and Noi Bai. Supporting elements included four EB-66s with their eight escorting F-4Cs, one EC-121D Warning Star, two NSA RC-130B-IIs, several Boeing KC-135 tankers and a cadre of Sikorsky HH-3 Jolly Green Giant rescue helicopters and their accompanying Douglas Skyaiders. The whole force would be covered by 16 Lockheed F-104C Starfighters while withdrawing from North Vietnam.

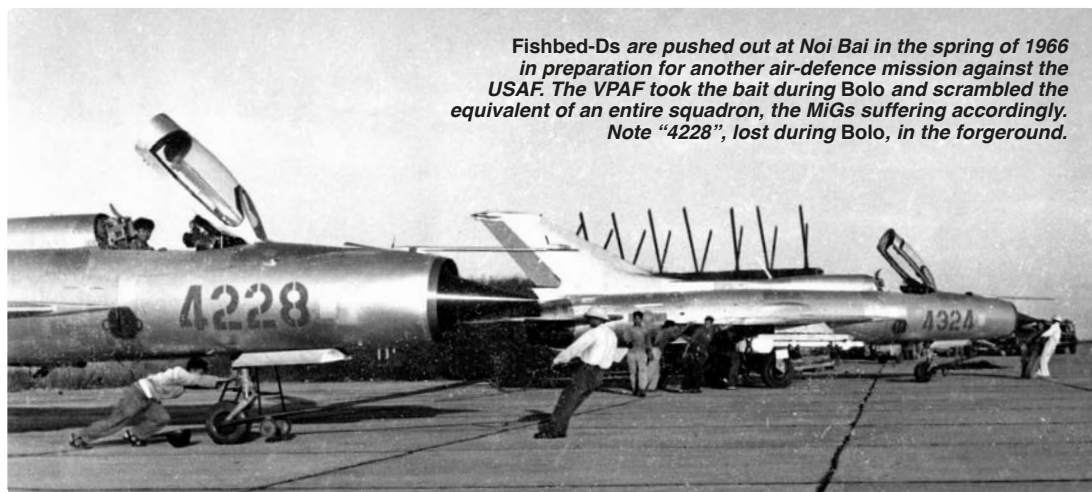
The planners determined that if the MiGs took the bait, their fuel endurance from take-off to landing would be a maximum of around 55min. Accordingly, the arrival times of the Phantom flights over the targeted airfields were set 5min apart, to ensure continuous coverage and provide maximum opportunity for engagement in the target area, the idea being to run the MiGs out of fuel by preventing them from landing. The mission was also planned so that no other American aircraft would be active in the area, allowing the first three flights of F-4s "missile-free" engagement without first having to identify the target.

BOLO IS GO!

It was not until December 30, 1966, that the participating pilots were informed about the forthcoming operation. Details of the plan were meticulously gone over, particularly the need to adhere strictly to the specified flight parameters, in order to simulate convincingly the performance of the lumbering Thuds. It would be the first time the pilots had used the ECM pods. Olds also charged his maintenance crews with inspecting, cleaning and repairing all equipment on the aircraft assigned to the mission, and fine-tuning each missile. The crews worked non-stop for 27hr. As soon as the F-4s were fitted with the ECM pods, the date of the operation was set for January 1, 1967.

The mission was delayed, however, owing to bad weather, and rescheduled for the next day.

Fishbed-Ds are pushed out at Noi Bai in the spring of 1966 in preparation for another air-defence mission against the USAF. The VPAF took the bait during Bolo and scrambled the equivalent of an entire squadron, the MiGs suffering accordingly. Note "4228", lost during Bolo, in the forgeround.



Olds authorised a small party to celebrate the New Year although Stone, the operation's main planner, was tense and nervous and slept poorly. The mission was launched during the afternoon of January 2, despite the latest weather forecast indicating a solid overcast over the Hanoi area.

The North Vietnamese radars detected the incoming aircraft as they were being refuelled over Laos to the west and the Gulf of Tonkin to the east. Flying low over the latter were the two C-130B-IIIs of the NSA, carrying Vietnamese, Chinese, Russian and Korean translators, who monitored the North Vietnamese radio frequencies. The North Vietnamese air-defence system was on full alert.

Leading a flight that bore his name, Olds was the first to arrive over Noi Bai airbase at 1500hr local time. Flying south-east along the ingress route used by the F-105s at 480kt, with its ECM pods turned on, the flight drew no defensive reaction and turned northwards to clear the area. Usually, the VPAF maintained a CAP over the airbase, with another further north and another west of Phuc Yen, over the Red River, during Thud attacks along that penetration route. If the engagement developed favourably for the North Vietnamese, additional MiGs would be launched. This time the air-defence commanders seemed confused, probably owing to the strikes taking place against radar and SAM sites by EF-105Fs.

The commanders thus delayed the launching of their interceptors and awaited a clearer situation.

A frustrated Olds and his flight continued northwards, wondering if the enemy had taken the bait and seriously considering whether to cancel the mission. After about 15min a VPAF order was given for a force of MiG-21s to take off. The NSA operators immediately sent a warning to Olds on a pre-selected radio channel, but the message failed to get through owing to defective radio equipment in Olds's Phantom. Fortunately, the commander of the East Force, then arriving from the Gulf of Tonkin, received the NSA message and forwarded it to Olds, who immediately dropped his external tanks and turned back towards Hanoi with full afterburner, forbidding any BVR missile engagements, as per the plan, to avoid hitting friendly aircraft coming the other way.

Captain Ralph Wetterhahn, callsign *Olds 2*, was the first to obtain fleeting radar contact ahead. Suddenly, a MiG-21 popped up from the thick overcast at 7,000ft (2,100m) just behind the *Olds* flight and was seen by the arriving *Ford* flight, which sounded the alarm. Breaking hard, the *Olds* flight evaded this first enemy pass, after which Olds spotted another MiG-21 emerging from the cloud at his 11 o'clock, at which he fired two Sparrows, neither of which hit its target. Closing in, he fired an AIM-9B which also did not

McDonnell Douglas F-4C 63-7680 was the Phantom flown by Col Robin Olds during Operation Bolo, armed with AIM-7E Sparrows mounted in underfuselage troughs (two forward and two aft) plus a pair of AIM-9B Sidewinders on each wing. The AN/ALQ-72 ECM pod fitted for Bolo is shown beneath the tail. Olds's Phantom was yet to be marked with the "FP" tailcode of the 497th TFS, 8th TFW. Artwork by TOM COOPER © 2017





ABOVE Olds (left) before he had grown his distinctive but strictly non-regulation moustache, alongside Capt John B. Stone, the operations officer responsible for planning Bolo.

LEFT Captain Walter Radeker of the 555th TFS poses with an "FG"-coded Phantom of the 433rd TFS at Ubon in Thailand in early 1967. The Phantoms were pooled for Bolo, and only those deemed best were used.

guide. A third MiG-21 popped up at Olds's ten o'clock position. Olds barrel-rolled to starboard and found himself above the third MiG, half inverted. He held his position until the MiG-21 had finished its turn, and moved into position 1,500yd behind the MiG. With a deflection angle of 20°, Olds launched two Sidewinders, one of which hit the MiG and tore off its starboard wing.

PUT 'EM UP

Meanwhile, Wetterhahn had lined up behind a MiG-21 pursuing Olds, and fired a pair of Sparrows that turned the MiG into a ball of fire. At roughly the same time, Capt Walter S. Radeker III, *Olds 4*, spotted a MiG-21 tracking his element leader and manoeuvred to engage it. Unable to acquire a consistently good tone (indicating a missile lock) Radeker launched a Sidewinder that guided perfectly anyway, and struck the *Fishbed* forward of its tail, sending it into a spin.

Next it was the *Ford* flight's turn to be engaged by three MiG-21s, which also attempted a pincer attack; one closed in from the six o'clock position and two from the ten o'clock position. The latter pair tracked the two leading F-4Cs, which broke hard. Captain Everett T. Raspberry Jr, *Ford 2*, performed a barrel roll that placed him in a perfect position behind the trailing MiG, which he brought down with a Sidewinder.

The NSA translators now heard the angry and worried voices of the MiG pilots explaining that instead of the expected F-105s, they were facing AAM-equipped Phantoms. One MiG pilot even requested authorisation to land. It was too late. In the confusion of the moment, additional *Fishbeds* were launched, a total of 14 MiG-21s taking off.

Rambler flight, led by Stone, arrived over Noi Bai to be confronted head-on by four MiG-21s, followed by two more slightly below and two

miles (3km) behind. Stone put his Phantom into a dive and launched a Sparrow, which failed to ignite. He fired a second, then a third Sparrow which locked on and hit one of the MiGs. Seconds later, a MiG-21 crossed in front of *Rambler 2* (Lawrence Glynn), who fired a pair of AIM-7Es — one of which turned the *Fishbed* into a ball of flame and debris, which slightly damaged his Phantom. Finally, *Rambler 4* (Maj Philip P. Combies) also fired two AIM-7Es against a MiG-21, one missile hitting its tail, forcing the pilot to eject. The American aircraft were now targeted by SAMs and Olds ordered everybody to withdraw towards the Laotian border. The entire combat had lasted 12min.

The final four flights of 8th TFW aircraft arrived to find the engagement over and, wary of the SAM threat, departed the area. The Da Nang-based East Force assessed the weather conditions and decided against penetrating North Vietnamese airspace. Two Phantoms of the Ubon-based West Force had aborted the mission for technical reasons, and ultimately only 26 of the 56 assigned fighters entered the target area; of those only 12 had engaged.

The triumphant return of the Phantoms was awaited at Ubon. All the pilots performed their traditional victory rolls except Stone, who, exhilarated that his planning had worked as planned but exhausted, did not want to push his luck and landed directly. Olds organised a huge party for all involved, taking care to thank the groundcrews for their efforts too.

The USAF claimed a record seven MiG-21s shot down on a single engagement during *Bolo*. The American missiles, well maintained and upgraded for the operation, had worked well, achieving a kill ratio of 20 per cent for the AIM-7E Sparrow and 33 per cent for the AIM-9B



ABOVE Bearing a red star victory marking on its intake splitter plate, F-4C 64-0838 was photographed a few weeks after Bolo, when it was flown as Rambler 4 by Maj Philip Combies of the 433rd TFS, and during which it shot down a MiG-21. This Phantom still exists and is displayed at the US Space & Rocket Center at Huntsville, Alabama, USA.

Sidewinder, compared to an average kill ratio of eight per cent and 15 per cent respectively during Operation *Rolling Thunder*. North Vietnamese sources, however, acknowledged only five aircraft shot down, with all their pilots being able to eject safely.³ Did the Americans exaggerate their claims despite each claim being thoroughly analysed? A likely explanation is that the two other MiG-21s were almost certainly flown by North Korean pilots, as recorded in the NSA SIGINT intercepts.⁴

THE AFTERMATH

Despite its losses, the VPAF's 921st FR continued operations over the following days, including trying to shoot down weather-reconnaissance aircraft over North Vietnam. Olds took the opportunity to set another trap, despatching two F-4Cs flying in close formation to appear as the usual weather-reconnaissance RF-4C, on January 5, 1967. The North Vietnamese did not take the bait on this occasion, but on a repeat mission the next day four MiG-21s were launched to intercept, two of which were shot down.

After this new setback, the VPAF decided to

suspend MiG-21 operations for more than three months in order to analyse these engagements and develop new tactics. The VPAF High Command recognised that it had acted too boldly, becoming overly self-confident in its ability to conduct operations in a changing tactical situation, making the mistake of launching the equivalent a full squadron of MiG-21s. It was realised that the VPAF should restrict itself to its own "guerrilla air warfare" doctrine, i.e. use its interceptors only in favourable conditions or give up and wait patiently to fight another day. Its pilots, despite being eager to fight, were still too inexperienced to face highly trained American veterans of the Second World War and Korean conflict.

Among the pilots involved in the dogfight of January 2 was Capt Nguyen Van Coc, who ejected from his stricken aircraft and landed by parachute back at base. He immediately requested another MiG-21 be made ready so he could continue the fight. He was calmed down, but swore that he would avenge this defeat, and over the following months would claim nine kills, with seven acknowledged by American sources,

OPERATION BOLO: THE USAF VICTORIES COMPILED BY ALBERT GRANDOLINI

The following table summarises the 8th TFW's seven MiG-21 victories during Operation *Bolo*, January 2, 1967

| Squadron | Callsign | Aircraft Commander* | 2nd Pilot | Missile |
|-----------|------------------|------------------------------|-------------------------------|---------|
| 555th TFS | <i>Olds 2</i> | Capt Ralph F. Wetterhahn | 1st Lt Jerry K. Sharp | AIM-7E |
| 555th TFS | <i>Olds 4</i> | Capt Walter S. Radeker III | 1st Lt James E. Murray III | AIM-9B |
| 555th TFS | <i>Olds 1</i> | Col Robin Olds | 1st Lt Charles C. Clifton | AIM-9B |
| 555th TFS | <i>Ford 2</i> | Capt Everett T. Raspberry Jr | 1st Lt Robert W. Western | AIM-9B |
| 433rd TFS | <i>Rambler 4</i> | Maj Philip P. Combies | 1st Lt Lee R. Dutton | AIM-7E |
| 433rd TFS | <i>Rambler 1</i> | Capt John B. Stone | 1st Lt Clifton P. Dunnegan Jr | AIM-7E |
| 433rd TFS | <i>Rambler 2</i> | 1st Lt Lawrence J. Glynn Jr | 1st Lt Lawrence E. Cary | AIM-7E |

*In 1967 all USAF F-4s were crewed by two rated pilots, with the more experienced flying the front seat as "aircraft commander". The use of rated navigators as Weapon Systems Officers began in 1969



ABOVE In the wake of the Operation Bolo setback, the VPAF grounded its MiG-21s for several weeks before returning to combat with revised tactics, which inflicted heavy losses on the Americans in the last days of the Rolling Thunder campaign, which ended in 1968. Here VPAF ace Nguyen Nhat Chieu (far left) relives a combat.

placing him at the top of the scroll of aces of the Vietnam War.

Olds scored three more aerial victories as the head of the 8th TFW. Reportedly, he passed up several opportunities to achieve another kill to become the first American ace of the conflict, not wanting to be sent back to the USA before the end of his tour of service in South-east Asia. After his departure, Olds's achievements in improving air-combat training were not adopted by the USAF, which preferred to focus on technology developments, such as the introduction of the AIM-4D Falcon air-to-air missile, which proved to be a great disappointment. The NSA's C-130B-IIs were not used again in a tactical role despite their clearly proven value. Their capabilities were partly filled by a new electronic device, the QRC-248 interrogator, installed on EC-121Ds from October 1967, which enabled the Warning Stars to read the MiGs' IFF transponders, detecting them even at low altitudes.

The MiG-21s returned to front-line operations in April 1967 with new tactics. After suffering heavy losses, particularly in May, the North Vietnamese once again overcame their difficulties. In this ongoing duel, both sides constantly refined and adapted their tactics to each new development. The previously unassailable superiority of the Phantom was increasingly in jeopardy. The North Vietnamese fighter force regained the initiative at the end of the *Rolling Thunder* campaign, inflicting serious losses on attacking enemy aircraft, claiming 22 per cent of the total of those

shot down, anti-aircraft artillery accounting for most of the rest. The wheel had turned and the ratio of kills to losses, at one point three to one in favour of the Americans, had declined to a mere 0.85 to one. By January 1968 the ratio had shifted to five to one in favour of the MiG-21s. It took the Americans several more years to deal with this threat by improving technologically, and tactically by devising a new air-combat training programme.



ENDNOTE REFERENCES

- 1 The secret military accord signed between North Vietnam and China in February 1964 envisaged the deployment of the People's Liberation Army Air Force in case of American air attacks undertaken against the North. Hanoi was bitterly disappointed when Beijing did not fulfil its promise. However, the VPAF's MiGs could seek asylum on Chinese air bases across the border.
- 2 Bolo — a traditional large knife, like a dagger, carried by Philippine warriors.
- 3 Pilots involved were Bui Duc Nhu, Nguyen Danh Kinh, Nguyen Duc Thuan, Nguyen Van Coc and Vu Ngoc Dinh.
- 4 By monitoring the radio frequencies used by the VPAF, the 22 linguists aboard the two C-130B-IIs recorded conversations of the following cumulative lengths during Operation Bolo: 27hr in Vietnamese; 10hr in Korean; 3hr 10min in Chinese; 20min in Russian. These totals comprise the initial phase before the arrival of the American aircraft, the actual combat and its immediate aftermath. The implication of the North Korean is obvious.



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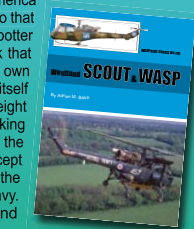
Vought OS2U Kingfisher

As the mighty battlewagon ploughed through the waters of the Pacific few would have noticed the little aircraft perched on the ship's stern. To many it was 'old, slow and ugly' while to others it was veritable life saver. The name of this unsung hero: the Vought OS2U Kingfisher. Designed initially for gunnery spotting duties the Kingfisher was lightly armed defensively although once America entered the war it soon found itself totting depth charges. Manned by a crew of two that consisted of a pilot and the guy in back who did everything else the little spotter aircraft soon earned itself a solid reputation. It was the rescue mission at Truk that made the aircraft famous. After a heavy raid upon Truk the crew spotted their own airmen struggling in the water. Setting down the little Kingfisher soon found itself festooned in rescued aircrew. The little engine managed to drag the overweight machine to a meeting with a submarine where all were rescued, the slowly sinking aircraft being sunk. The rescue efforts of the Pacific Kingfishers plus those of the Martin Mariner (also in this series) formed the basis of the air sea rescue concept in use today. Outside of the US Navy the OS2U was flown by the USCG, USMC, the Fleet Air Arm, various Latin American countries, the RAAF who took it to the Antarctic plus the Russian Navy. Fortunately a handful survive in preservation in Australia and the United States. This book is written by Kev Darling and is superbly illustrated by Richard J. Caruana.

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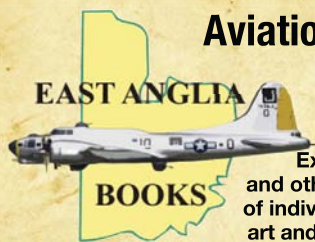


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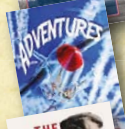
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The John Stroud Archive

OPEN WIDE!

Lympne-Le Touquet, 1950

When independent British airline Silver City reopened its seasonal air car-ferry operation to France in the spring of 1950, John Stroud was invited to Lympne to sample the service for himself and write it up for *Flight*. **NICK STROUD** (no relation!) provides some historical background to accompany John's photographs of a memorable trip "*au bord de la mer*"





One of Britain's most respected aviation journalists and authors, John Stroud (born April 3, 1919) joined Imperial Airways aged 14. Six years later he became a freelance aviation writer and in 1963 was appointed General Editor of the definitive Putnam series of aeronautical books. Also a talented photographer, John continued to contribute articles to the British aviation press until his death in March 2007. In 2014 a substantial part of John's archive, including numerous rolls of previously unseen 35mm film, was acquired by A Flying History Ltd and forms the basis of this regular *TAH* series

WHEN JOHN STROUD was invited to accompany a motley collection of motor cars, ancient and modern, aboard a Silver City Bristol Freighter across the English Channel in April

1950, the carriage of automobiles over *la Manche* was nothing new. Indeed, motor vehicles had regularly been traversing the narrow stretch of water separating Britain and the Continent since the late 1920s, when the Townsend Brothers Company launched the first regular cross-Channel ferry service with the converted coal ship *Artificer*, which, on June 28, 1928, sailed from Dover to Calais in 2hr 30min with 15 cars aboard. The following year the service became permanent and by the end of 1931 the Southern Railway Company had opened the Dover—Calais Autocarrier ferry service, which had a capacity of 120 passengers and could transport some 35 cars.

The days of easy “roll-on, roll-off” shipborne ferry services were still more than 20 years in the future, however, the cars having to be hoisted aboard the converted coal ships and minesweepers by crane — a time-consuming and labour-intensive process. Nevertheless, by 1936 some 6,000 cars were being transported across the Channel each year, rising to 31,000 in 1939, after which the numbers began falling off owing to the very real prospect of war in Europe.

A golden — or silver — opportunity

One of the regular post-war voyagers aboard the cross-Channel car ferries was Air Cdre Griffith J. “Taffy” Powell, former wartime ferry pilot and co-founder and Managing Director of Silver City Airways, established in late 1946 with money from British and Australian mining interests to provide a regular air link between the UK and the conglomeration's operations worldwide. Powell liked to “get away from it all” by touring France in his Armstrong Siddeley Lancaster car, which had to be drained of fuel once he reached a Channel port, then ignominiously



LEFT *Steady as she goes! With the clamshell doors of Bristol Freighter G-AIFV thrown open in a wide smile, the 1904 Darracq is reversed down the loading ramp at Le Touquet on Friday, April 14, 1950. The car is still roadworthy in 2017 and remains a regular participant in the UK's London—Brighton Veteran Car Run.*

Putting the “car” into “cargo” — the Darracq is driven up the ramp at Lympne, while the Alvis TA21 awaits its turn. Just visible in the background is an Avro Anson of the Kenley-based No 61 Group Communications Flight, coded RCE-F.



hauled aboard a ferry, after which reams of paperwork had to be completed.

Having had experience of Bristol's capacious Type 170 during Silver City operations in India during 1947–48 — when the company borrowed Wayfarer G-AHJC from Bristol to help in the airlift of members of the Muslim population to their prospective new home in Pakistan — Powell saw an opportunity to slash car-ferry travel times to the Continent. The Bristol 170 (passenger-only versions without the distinctive clamshell nose-doors were Wayfarers; the predominantly cargo versions with the door were Freighters) had already demonstrated its ability to carry cars during a publicity tour of the USA, during which automobiles were frequently loaded aboard a Freighter and flown round the circuit. Powell had found the perfect machine for his air ferry concept and set about acquiring a fleet of Freighters for Silver City.

By the summer of 1948 Silver City had three Bristol Freighters on strength, Mk I G-AGVC joining Mk IIs G-AHJC and G-AHJG that July (with G-AHJO supplementing the fleet the following month), all three examples initially being leased rather than purchased outright. On June 15, 1948 (not July as sometimes stated), Powell's Lancaster saloon was loaded aboard G-AGVC at Silver City's base at Lympne on the Kent coast and flown the 47 miles (75km) to Le Touquet, near Boulogne in northern France, technically the closest French civil airport to the UK. On arrival 20min after departure from Lympne the car was rolled through the Freighter's clamshell doors and down the specially-fabricated loading ramp brought along with the aircraft. This trial flight had proved a roaring success, and plans were put in place to establish what would initially have to be a charter service, the provisions of the 1946 Civil

Aviation Act reserving scheduled-service route allocations to the “big three” state-run airlines — British European Airways (BEA), British Overseas Airways Corporation (BOAC) and British South American Airways (BSAA).

To circumvent this obstacle, Silver City brokered an arrangement with the two big motoring organisations, the Automobile Association (AA) and the Royal Automobile Club (RAC), which would effectively block-book the service as a regular charter, thus neatly sidestepping the scheduled-service issue. The fare was set at £27 0s 0d for a medium-sized car and four passengers, and £32 0s 0d for a large car and its passengers.

With the paperwork in place and a healthy bookings list, Silver City flew its official inaugural Channel air ferry flight on July 14, 1948, in the hands of Capt “Storm” Clarke and copilot Jerry Rosser. Despite the privations experienced at both ends of the operation — Lympne was still rather primitive and the once-fashionable but now war-weary Le Touquet was a shadow of the glittering fleshpot it had been in the 1930s — the service gained momentum throughout the summer of 1948. After three months of continuous air ferry operations, Silver City closed the service for the winter in October, having carried some 170 cars and their passengers to and from the Continent.

Seasons in the sun

Deemed a great success, the venture led to permission being sought from the Ministry of Civil Aviation to establish the service on a regular footing, and an “Associate Agreement” with BEA to cover operations the following year was put in place. The 1949 season would commence in mid-April with four services a day in each direction, the fare being held at the 1948 rate.

On arrival at Le Touquet the cars were offloaded by Silver City staff and parked beside the terminal for collection by their owners. Le Touquet had been an active Luftwaffe fighter base during the war until 1944, when Rommel had a number of airfields disabled as a result of his (well-founded) concern that an Allied invasion of the French coast was imminent.



Having kept the Freighters earning throughout the winter with various charter flights, including the shipment of racehorses and livestock to destinations in Europe and the Mediterranean, Silver City inaugurated the 1949 season on April 13, despite lukewarm, not to say gloomy, forecasts from the AA and RAC — which displayed a surprising degree of pessimism, given the remarkably encouraging results of the previous season.

Silver City need not have worried; bookings took a sharp upturn from June and another two Freighters had to be leased to cope with demand. By August the company was undertaking up to 20 round trips a day, the highest number of flights being completed at weekends. On August 5 the 1,000th passenger on the ferry service was carried. Indeed, by the end of the season the numbers for the air ferry service were substantially better than those for the previous year; by the time the service was closed for the winter in October 1949 the airline had carried some 2,600 cars, 100 motorcycles and nearly 8,000 passengers, using only a handful of aircraft. Profits were up and the Silver City Channel air ferry was here to stay.

And so it was that John Stroud was invited to partake of the service with a cross-Channel flight in April 1950, by which time the company was fielding a fleet of six Freighters for the air ferry service — the original three, which had been extensively overhauled by Bristol over the winter at Filton, and three others, some of which were operated by Silver City's French subsidiary, *Société Commerciale Aérienne du Littoral (SCAL)*, established in February 1949 to square the paperwork for the French part of the operation. Accordingly, John presented himself at Lympne on April 14, 1950, to sample the facilities and file a report for British weekly magazine *Flight*.

An added touch of colour for John's report was the ferrying of a number of unusual vehicles spanning five decades of automotive development. One was Alvis's "next year's model", a 1951 TA21 test vehicle; the other was a 15 h.p. four-cylinder Darracq with a detachable tonneau body, representing the state of the art circa 1904. The Alvis was on its way to the Amsterdam Motor Show, but quite why the vintage Darracq was *bocage*-bound is unknown; presumably as it returned the same day it was just a day trip pottering about the French countryside. A 1950 Austin A70 also made the crossing, although John states that the three cars were transported in two Freighters that flew the route together. The photographs that illustrate this article, taken from a roll of 35mm film, clearly show that the Alvis and the Darracq travelled together in the hold of Freighter Mk 21 G-AIFV on the outbound flight, which departed the Kent airfield at 1414hr with Capt Hopkins at the controls, and arrived 23min later at Le Touquet, the Austin presumably travelling alongside in another Freighter.

John was impressed with the service, noting that, "in spite of the fact that the motoring organisations have done much to simplify the carriage of cars by sea, the air method presents a particularly trouble-free means of taking a vehicle across the Channel". Passengers accompanied their vehicles in an 11-seat cabin to the rear of the aircraft, John also remarking that the cars were quickly loaded and unloaded by well-trained staff, and that the long waits often suffered at the sea ports were by and large avoided with the air ferry service.

On arrival at the still rather basic French airfield, the vehicles were reversed down the wheeled ramp and deposited on the tarmac, ready for collection by their owners. John then



ABOVE The 1951 Alvis TA21 is offloaded at Le Touquet, bound for the Amsterdam Motor Show (thanks to Hilton Holloway at automotive technology magazine 5054 for identifying the car!). Silver City expressed an interest in acquiring the eight-car, 40-passenger-carrying Blackburn Universal Freighter, but the plan ultimately fell through.

took the opportunity to explore the nearby town, which still very much bore the scars of its wartime years, and remained a far cry from its glory years of less than two decades before. After a spot of lunch in town and a wander among the dunes, he then returned to the airfield, taking photographs of the spartan accommodation and a de Havilland Gipsy Major-engined Potez 584 parked beside the hangar.

Back to Blighty

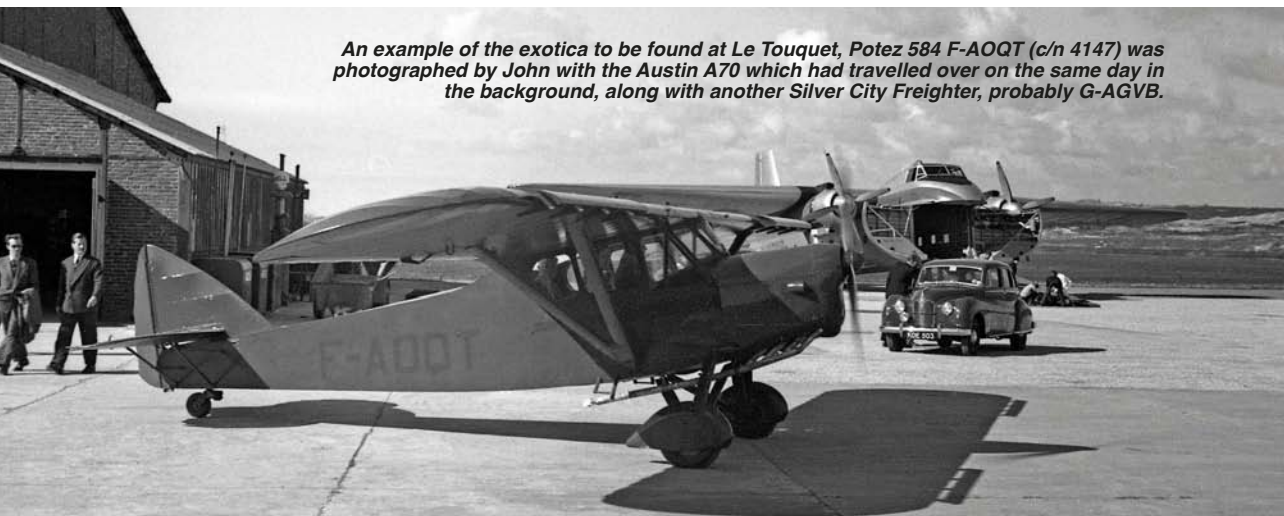
After a brief wait, the Darracq and Austin A70 were reversed up the ramp into G-AIFV, after which the passengers were embarked and the Freighter departed, John noting the take-off time in his logbook as 1820hr. A mere 22min later, the Freighter settled back on to the grass at Lympne and rolled to a halt for the unloading process to begin, the vehicles this time enjoying a simple forward drive down the ramp and off. John's

report for *Flight* was published with the title *Cars Go as Cargo* in the May 4, 1950, issue, and led off with a characteristically stylish introduction from the intrepid journalist:

"There are several accepted methods of crossing from the English to the French coast — by ordinary airliner, rail-ferry, mail steamer or even by swimming — but quite the most pleasurable and certainly the speediest way is to make the 20min flight from Lympne to Le Touquet, on which one may travel complete with car, family and as much luggage as one is likely to need on a Continental tour". It was a recommendation tens of thousands of travellers made good on over the next 12 years, Silver City becoming a household name in the UK until the company was taken over by British United Airways in 1962, the air ferry operations continuing under the aegis of British United Air Ferries/British Air Ferries until 1970.



An example of the exotica to be found at Le Touquet, Potez 584 F-AOQT (c/n 4147) was photographed by John with the Austin A70 which had travelled over on the same day in the background, along with another Silver City Freighter, probably G-AGVB.



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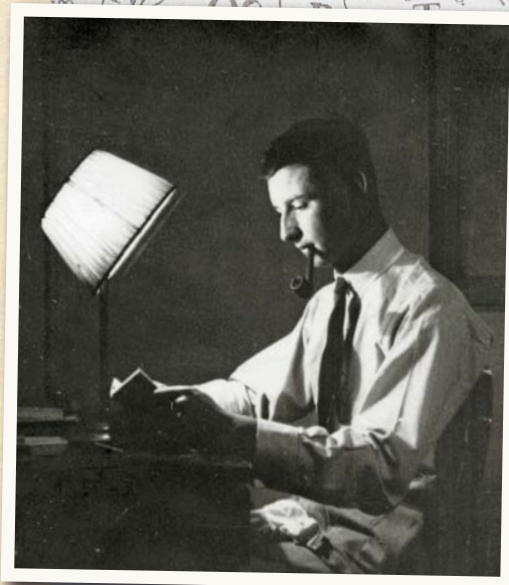
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THE GRAND TOUR

CAIRO TO PRETORIA
BY VICKERS VICTORIA,
FEBRUARY–MARCH 1934



ABOVE Flying Officer Richard Shaw enjoying a quiet moment in the old quarters at Heliopolis in 1934. Born in Castle Donington in Leicestershire in 1912, Shaw was sent to Scarborough College in 1923, before going on to the RAF College at Cranwell, after which he served with No 10 Sqn on Handley Page Hinaidis at Boscombe Down. He was sent to Egypt to join No 216 Sqn in 1933.

RIGHT & ABOVE RIGHT A keen photographer, the author kept a remarkable record of his many travels, whether it be flying over the Rand escarpment near Pretoria in South Africa in 1934, or refuelling at Asyut in 1935.

ALL IMAGES VIA JILLY McLAREN UNLESS OTHERWISE STATED

During the early 1930s RAF squadrons based abroad made regular long-distance flights over routes of potential strategic importance. In 1934 Cairo-based No 216 Sqn undertook a 6,000-mile round trip to South Africa. Vickers Victoria pilot the late **RICHARD H. SHAW** kept a diary of the tour, and we join him on the cruise down through East Africa to Pretoria

AT SEVEN IN the morning on February 26, 1934, our four Vickers Victorias from No 216 Sqn and five Fairey IIIIFs of No 45 Sqn were lined up on the tarmac at Heliopolis [Cairo] as we paraded before Air Commodore Bennet, who gave us a few words of advice and bade us farewell. We took off at 0725hr in formation and after an uneventful flight of 1hr 50min landed at Asyut to refuel. Flying Officer Hare noticed that one of the fittings attached to the spare Napier Lion engine which we were carrying under our starboard wing for the journey was shaking loose. A spare Bristol Pegasus engine was being carried by the No 4 Victoria.

An hour later we were airborne and heading down the Nile for Wadi Halfa, the first landing ground in Sudan [now North Sudan], where we arrived at 1415hr. On inspection we discovered a small crack in our port oil tank. During the course of the afternoon a new tank was fitted by the mechanics. That night was spent in a hotel at Wadi Halfa.







BELOW A group portrait of No 216 Sqn in front of a Victoria VI at Heliopolis, Egypt, in 1934. The author is seated in the front row, fourth from left, as enlarged in the inset LEFT. The unit had long been established in Egypt, initially bringing its Airco D.H.10s to Qantara in 1919 before moving two years later to Heliopolis, from where it operated for the next 20 years.



At 0740hr on February 27 we set out for Atbara, and followed the railway line across the desert to Abu Hamed, where we struck the Nile once more. This guided us to Atbara, where we landed at 1115hr. After a stay of 40min for refuelling we left for Khartoum, which is easily recognised, being the junction of the White and Blue Niles. After 2hr 15min we landed at Khartoum, where we spent the night in the Grand Hotel.

During the course of inspections it was discovered that Victoria No 4 had burst an oil tank, which was replaced immediately. It was also found that Victoria No 1 had broken an undercarriage fitting. The men worked all afternoon and all night in order to get the machine fit to fly at dawn, but still the job was not finished until 1100hr the next day, so we postponed our departure for 24 hours and stayed another night at the Grand Hotel.

On March 1 we left at 0600hr for Malakal [in what is now South Sudan]. After about 45min a sparking plug blew out of our starboard engine and we were forced to land near a small village. Within minutes the mechanic had fitted a new plug, so we took off and joined the formation, which had circled above waiting for us. It was interesting to note that the villagers did not rush out to meet us as we would have expected, but remained huddled in the shelter of their huts, as they had probably never seen an aeroplane on the ground before and must have been terrified.

We were now leaving the sandy desert and flying over the flat fertile black cotton-soil country, which is covered with a sparse growth of bush. At 1000hr we landed at Malakal, an important irrigation centre on the White Nile.

THE 1934 TOURISTS

THE 1934 AFRICAN tour consisted of a total of nine aircraft; four Vickers Victorias of No 216 Sqn and five Fairey IIIIFs of No 45 Sqn. The crew and serials (where known) were:

Victoria No 1 (K2807) Sqn Ldr P.H. Mackworth DFC; Sgt Biddulph; Wg Cdr E.T. Leather DFC, OC Flight; Flt Lt W.N. Boldero, OC stores & accounts
Victoria No 2 (K2343) Plt Off M. Sorsbie; Fg Off R.H. Shaw

Victoria No 3 Fg Off M. Hare; Plt Off F.W. Hilton
Victoria No 4 (KR2342) Fg Off U.Y. Shannon, Sgt Higham

Fairey IIIIF No 5 (KR1713) Sqn Ldr H.W.L. Saunders DSO DFC MM; Fg Off C.H. Moore, Navigator

Fairey IIIIF No 6 Fg Off H.R. Dale

Fairey IIIIF No 7 Fg Off J. Boston

Fairey IIIIF No 8 Fg Off D.R. Evans

Fairey IIIIF No 9 Sgt Hubbard

We spent 30min refuelling before continuing on our way to Juba. The further south we went the thicker the vegetation became, and bush fires could be seen everywhere. Juba is a very small station which has sprung into importance chiefly on account of its aerial traffic. We landed there at 1430hr and spent the night in the hotel there.

March 2 was a day of disaster. We intended to reach Moshi in north-east Tanganyika [now Tanzania], but only got as far as Nairobi in Kenya. We left Juba at dawn, 0555hr, and within 5min discovered that something was wrong with the petrol system; the pumps were not

Originally built as a Victoria Mk V, K2807 (No 1 on the tour) is seen here overflying the outskirts of Nairobi on March 2, 1934. The Victoria VI was essentially a Mk V with Bristol Pegasus engines replacing the original Napier Lions. With further structural strengthening the type was redesignated as the Valentia Mk I, and many Vs and VIs were ultimately converted to Valentia standard.



pumping the petrol from our main tank to the engines, and, as we had only enough petrol in our gravity-feed tanks for 90min flying, it was imperative that we should land at Nimule, an emergency landing ground on the banks of the Nile near the southern border of Sudan.

FROM DESERT TO MOUNTAINS

The country beneath us was becoming mountainous and covered with thick bush, which made a welcome change to our desert-accustomed eyes, but lessened our chances of making a successful forced landing. As we had no wireless aboard I got out the Aldis signalling lamp and, after much difficulty, managed to communicate to No 1 that we were in trouble and must land at Nimule.

The landing ground was very small, but all the Victorias got down safely at 0725hr, while the Faireys proceeded to Kisumu [in Kenya]. The mechanics soon dismantled the pumps but found that nothing was broken, so they were replaced. After a short test flight everything was working satisfactorily, so we decided that an air lock had been the cause of the trouble.

The natives wore nothing but a few strings of beads and were frightened at first, but curiosity soon overcame their timidity and they all collected around like a lot of children. Strangely enough the women smoked long pipes, and the men nothing at all.

After an hour's delay we all set off for Kisumu, but Victorias Nos 1 and 4 were running short of petrol, so we landed at Tororo in eastern Uganda instead. Immediately one crossed the Ugandan border one noticed the excellent way in which roads had been organised and maintained; either

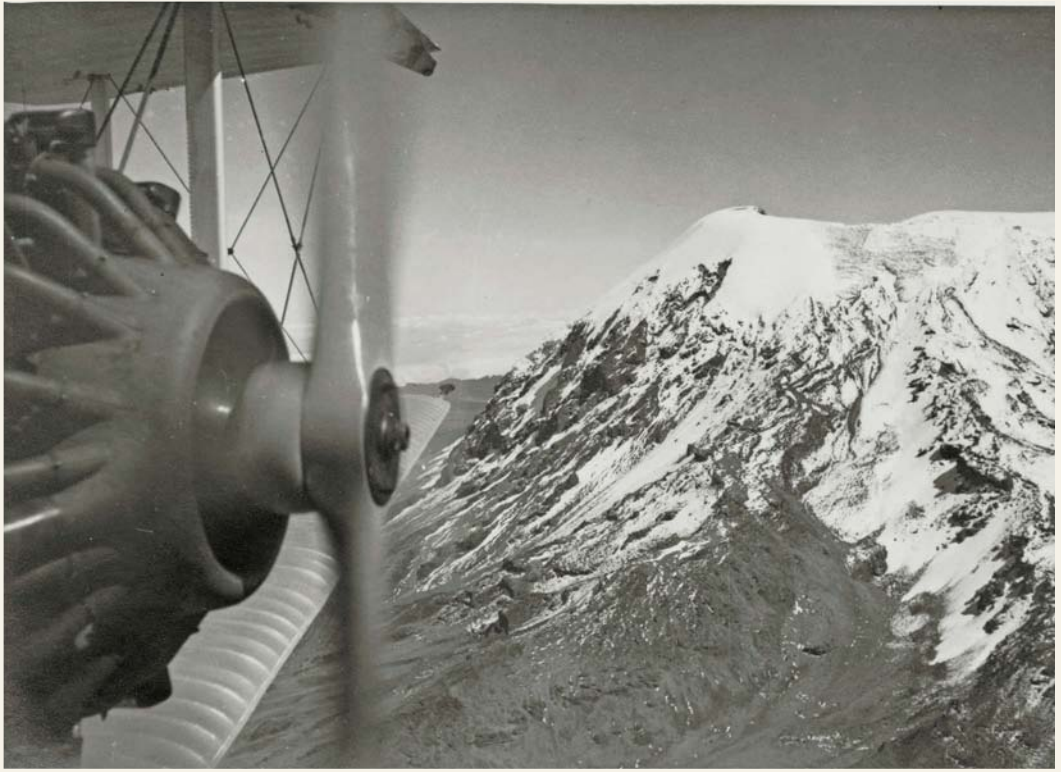
they have more need for them than in Sudan or else some far-seeing energetic person realises the value of opening up new country, but the difference was very striking.

We stayed at Tororo for an hour and a half before setting out for Nairobi at 1255hr. Very soon we got a glimpse of Lake Victoria and eventually passed over the extreme north-eastern corner of it at Kisumu, which is an important point on the Imperial Airways route.

We now struck westwards up a steep valley and followed the winding railway to Lake Nakuru, which is nearly 6,000ft [1,800m] above sea level. We had some difficulty in reaching this altitude, and found ourselves skimming over the tops of beautiful English-looking farmhouses with both throttles wide open — it was rather exciting! When we reached the top of the valley the sky became overcast and we ran into very severe tropical storms, which tossed the machine about like a feather, one particular bump was alarmingly rough and shook our spare engine in such a manner as to bend the steadying strut.

As we approached Lake Nakuru I was surprised to see that part of it was covered with a bright pink mass. On closer inspection I saw that it was a flock of thousands of flamingoes; they made a very unexpected and impressive sight and all took to the air as we passed over. There are many extinct volcanoes in the district and it looked very wild and desolate in the storm. Incidentally this was where we crossed the Equator. We landed at Nairobi at 1545hr.

On the aerodrome we found two of our own squadron's Victorias, piloted by Flt Lts Markham and Watts. They were returning to Cairo having toured central and east Africa with Sir



ABOVE *As the flight proceeded southwards the terrain changed from the sandy desert of northern Africa to the savanna grasslands of Sudan and on to the mountains of the Eastern Rift range, of which Mount Kilimanjaro is the highest point. The port Pegasus of the author's Victoria frames a magnificent view of a snow-capped peak.*

Philip Cunliffe-Lister, Secretary of State for the Colonies, and Air Vice-Marshal Cyril Newall, AOC RAF Middle East. Naturally we received a hearty welcome from our comrades, which cheered us tremendously after a very trying day. I stayed at the New Stanley Hotel. In the evening Bill Markham took Flt Lt Boldero, Fg Off Hare, Plt Off Hilton and me out to a sundowner party, to a house about ten miles out of town owned by a Mr Crofton, who was a "white hunter". It was three in the morning when we returned to the hotel — what a party!

KILIMANJARO!

At 0850hr on March 3 we set out for Moshi. It was only a short hop, but as they had made so many arrangements for our entertainment we simply had to spend a night there. After leaving Nairobi we found we were flying over an immense plain teeming with game of all descriptions; as we were not flying very low I was only able to recognise them as buffalo and many kinds of buck and gazelle. The sky was $\frac{8}{10}$ ths covered with clouds at first, but after we had been flying for an hour we noticed them breaking away ahead.

Then, suddenly, without any warning Mount Kilimanjaro came into view. It was an awe-

inspiring sight. For 19,000ft [5,800m] this beautiful smooth conical-shaped mountain rears itself up into the sky. It springs out of the flat plain and stands alone in solitary majesty. The lower slopes are covered with tropical vegetation and coffee plantations. Higher up, the growth was less prolific and took a darker hue. As the temperature decreases with increased altitude, so the flora changed from tropical and sub-tropical to temperate and frigid, the upper 3,000ft [900m] being covered with permanent snow. It was a sight for the gods.

Moshi is a small village on the southern side of the mountain, and we landed there at 1030hr. Every British member of the community was full out to give us a good time, and they certainly succeeded. In the afternoon I went for a bathe in a small concrete swimming pool which had been constructed by the local Inspector of Health, the cold, crystal-clear water running straight off the mountain, obviating the necessity of purification.

Afterwards we played simultaneous games of hockey and soccer and I refereed the hockey with "Bedlam" Sutton, the local bank clerk. Unfortunately we lost the hockey 2-3 — but we drew the soccer 4-4. That evening I dined with the Inspector of Health. During the course of conversation his wife said, "When I saw all your



ABOVE *Resplendent above the clouds, Kilimanjaro recedes from view through the airframe of Victoria VI K2343, the author's aircraft, probably after take-off from Moshi. At 19,000ft (5,800m), the perpetually snow-covered peak of Kilimanjaro would have been beyond the Victoria's own absolute ceiling of 18,500ft. Next stop Dodoma . . .*

aeroplanes come in this morning I was so proud to be British". She was very impressed and actually repeated those words three times that evening; it must be remembered that we were in Tanganyika, German territory until after the war. A good many Germans have stayed on, and have equal rights with any other nationality.

After dinner we went to a dance at the club; it was a very cheery party but I'm afraid I was rather tired and at midnight I sneaked off to the Kilimanjaro Hotel, where I was staying. I shall never forget those wonderful views of Kilimanjaro. At sunset the shadows of the horizon first enveloped us, and then it gradually began to creep up the sides of the mountain until finally it reached the snowcapped peak, which was transformed in colour from white to golden yellow and then to orange and red, which then gave place to purple and dark blue. Later on the moon rose, and when I looked out towards the mountain I perceived its dim black outline looming up in the darkness; but right above it was the snowcapped peak glowing iridescently in the moonlight, seemingly detached from the Earth and to all appearances like a new triangular-shaped body in the heavens. Then came the dawn. We in darkness below watched the sun tip the snow with golden light, before

the shadow of the horizon slowly crept down the mountainside just like the minute hand of a gigantic clock, until we too were bathed in the sun rays and another day had begun.

ACROSS TANGANYIKA

At 0930hr on March 4 we departed Moshi. The country was hilly and well covered with forests and bush so that we were unable to see any game. After 2½ hours of flying we landed at Dodoma, which is on the railway from Dar es Salaam to Lake Victoria. Here it was discovered that Victoria No 4 had cracked another oil tank. A temporary repair was effected and at 1100hr we set off for Mbeya. Once more the country took on a mountainous aspect intersected by deep afforested river valleys, which presented little or no chance of making a forced landing.

We gradually approached a long range of mountains, and high up between two peaks saw Mbeya landing ground, which is 5,000ft [1,500m] above sea level, and where we landed at 1345hr. The local mechanic immediately set to work, with the aid of an assistant, to rivet a copper oil tank which had been made at Nairobi for us. Unfortunately it took them 20hr to do the job, so instead of leaving Mbeya the next day we had to spend two nights there.

Keeping the Victorias of No 216 Sqn company during the 1934 East African tour were four Fairey IIIFs of No 45 Sqn, based at Helwan near Cairo. The IIF was powered by a Napier Lion engine, and it was presumably for the Faireys that a spare Lion engine was carried beneath the starboard wing of No 2 Victoria for part of the 1934 tour.



PHILIP JARRETT COLLECTION

The Mbeya Hotel is rather a curious one. It is the nearest place to the Lupa Gold Field, and the proprietor, a former gold prospector, told us some rare tales of how the men frequently came in from the diggings with their pockets full of gold, ordered a case of champagne and sat round it on the floor of the bar until it was empty. They kept on drinking champagne until they had no more gold, at which point they went back to the diggings to find some more. Consequently they never saved any money and usually died in the diggings just as poor as when they had arrived.

The Faireys left Mbeya on March 5 for Broken Hill [in Northern Rhodesia — now Zambia], but we set out at 0700hr the following day. The clouds were fairly low so we flew above them, and for about an hour saw very little of the ground. When we did eventually come below the clouds we found that the country had become more even, but was still covered with bush. After some time we managed to find Mpika in Northern Rhodesia, where we landed at 0950hr to refuel.

An hour later we left Mpika for Broken Hill. The clouds were still very low and tropical storms reduced visibility to nil at times, but by following the Great North Road we were able to keep a check on our position. Towards Broken Hill a vast plain opened out and large cultivated farms appeared; we were gradually approaching civilised South Africa.

A smudge of smoke on the horizon indicated the industrial town of Broken Hill (now Kabwe), where we landed at 1335hr. Speedily we made our way towards Boon's Hotel, where we were to spend the night. Broken Hill is a town of the

past, its mineral resources seemingly exhausted; there is no money in the town, and altogether the prospects for its future look very bleak.

In the evening we went to have a sundowner with the District Commissioner, and after dinner went to a dance at the Railway Hotel. It was a very dull affair and I am sorry to say that Broken Hill was the only place we visited which we were pleased to leave.

INTO SOUTHERN RHODESIA

At 0715hr on March 7 we were airborne and set course for Salisbury [now Harare]. After an hour's flying we saw that a tremendous valley, some 2,000ft [600m] deep, was intersecting the country from east to west. It was the great Zambezi river. The ground of Northern Rhodesia seemed to drop away from underneath us, and as we passed over the gorge, Southern Rhodesia [now Zimbabwe] came up to meet us with a bang. The clouds were low on the hilltops and it was raining intermittently. So we had an exciting half an hour dodging around cloud-covered hills and trying to follow the Great North Road at the same time, while keeping more or less in formation with the other machines.

Presently the weather cleared as the average height of the ground decreased, and in the glorious sunshine we found ourselves flying over rolling pasture lands broken only by ranges of small hills, and I am almost positive I saw two black lions about 100 miles [160km] before we got to Salisbury. We landed at Salisbury at 1015hr and found a large crowd waiting to receive us, among whom was Leonard Jearey, one of my friends who had just resigned from



ABOVE One of the many photographs taken by the author during the 1934 East African tour, this one shows one of the circular rondavel huts that were part of the hotel at Mbeya in Tanganyika (now Tanzania), where the intrepid tourists had to spend two nights while local mechanics worked on fitting a new copper oil tank for Victoria No 4, KR2342 (R for rebuilt).

the RAF. His mother and sister were also there. Much as we would have liked to stay, we had to push on to Bulawayo at 1130hr.

Our route took us over 200 miles [320km] of rich plains and bush country which is almost completely uninhabited and just waiting for settlers to come along and make use of the country. When we were flying fairly low at one point during the journey I was amused to see two ostriches scuttling along in the bush with their wings stretched out and their long legs moving at an amazing speed.

We had the wind against us and did not land at Bulawayo until 1400hr, when we were enthusiastically received by the faithful few. We had luxurious bedrooms in the Prince's Residential Flats and were royally fed at the club, an excellent institution of long-standing tradition. After dinner they introduced us to a special South African liqueur called Van der Hum, which was appreciated by all. Then we were taken to the pictures, where some of our hosts succumbed to the after-effects of our excellent dinner by falling asleep.

AT LAST, SOUTH AFRICA

At 0700hr on March 8 we set out for the Union of South Africa with no small feeling of excitement. Our kind friends warned us that we were going into a foreign country, and that we ought to be on our very best behaviour, as the Dutch South Africans were rather "touchy", but I for one found this warning entirely unnecessary.

Soon after leaving Bulawayo we crossed over the famous Matobo Hills and flew above the semi-bush country until we reached the lazy



MAP BY MAGGIE NELSON

Limpopo river, which languidly twists, curls and winds through the plains forming the boundary between Southern Rhodesia and the Union of South Africa. Technically speaking, we were now flying over the high veldt, which is semi-bush country broken by red granite kopjes of amazing shapes and sizes, and by long mountain ranges such as the well known Drakensberg, with its curious outcrops and foreboding irregular peaks.

At 0950hr we landed at Pietersburg [now Polokwane] which is a queer little farming dorp at the back of beyond. Here I opened my sandwiches, which the Bulawayo Club had provided for us, and was pleasantly surprised to find there was also a small bottle of beer and an opener. A similar gift was received by everyone else — what a club! Exactly one hour later we took off for the last stage of our journey.

I personally was most excited. Shortly after leaving Pietersburg the veldt dropped considerably in height and took on a more



ABOVE *Victoria No 2 over Pretoria, the administrative capital of the Union of South Africa, where the tour arrived to great fanfare on March 8, 1934. The city was looking its best, as the squadron's arrival in Pretoria coincided with a visit by HRH The Prince George, a keen advocate of aviation, who was on an official tour of South Africa.*

civilised aspect, and large farms could be seen dotted about every ten or 20 miles [15–30km]. After an hour's flying, when we were ten miles south of Nylstroom [now Modimolle], we were met by an escort of the South African Air Force (SAAF), consisting of three flights of five Westland Wapitis each, and one Vickers twin-engined general purpose machine. The 23 aeroplanes flying in their own formations passed over the fine city of Pretoria, to Zwartkopp aerodrome, some three miles [5km] distant on Roberts Heights [now Thaba Tshwane], the SAAF's HQ, and where a large military garrison is also maintained.

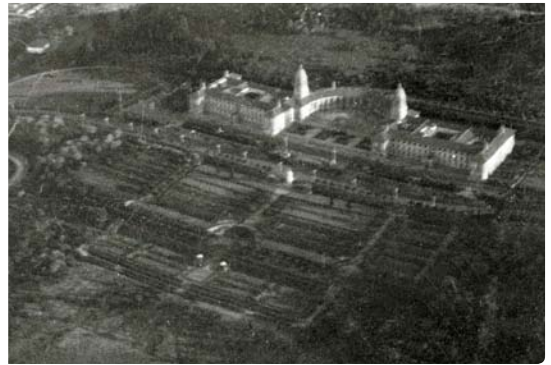
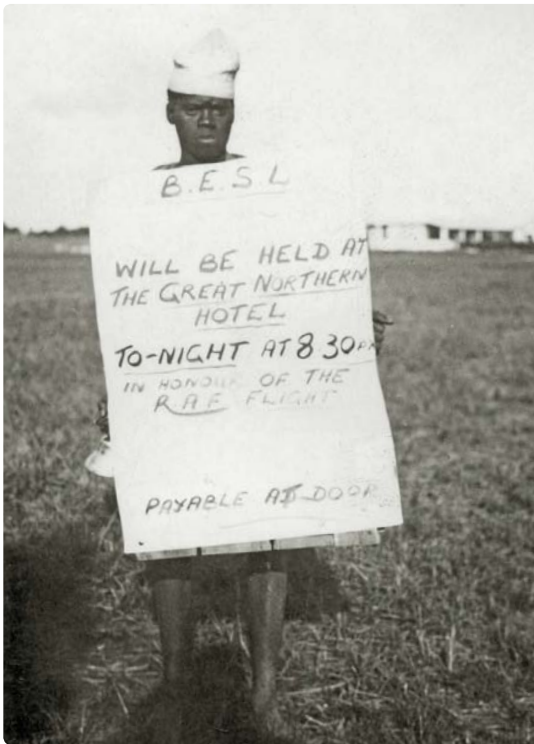
There must have been thousands of people waiting on the tarmac as we landed at 1230hr. We paraded before General Pierre van Ryneveld [the first to fly from London to Cape Town, in stages, accompanied by Sir Quintin Brand, in 1920], who welcomed us officially. Then I wandered off to talk to some SAAF officers. They were as friendly and hospitable a crowd as I have ever met in an RAF mess, possibly more so. Not once did I receive the impression that we were strangers or foreigners; we were just one of them, in spite of the fact that they were bilingual, mixing English and Afrikaans in the most bewildering manner.

On March 13, after a few days seeing the sights of Pretoria, I got up early, as one of the South

Africans I had met, Lt Sandenburg — “Sandy” — had promised me a “flip” in a SAAF machine before breakfast. So we dashed down to the aerodrome and, having signed an indemnity certificate, I climbed into an Armstrong Siddeley Jaguar-engined de Havilland [Airco] D.H.9, and away we went. First he showed me the old Boer forts on top of the kopjes all around Pretoria, then we went to have a look at the largest tree in the world, about ten miles away; reportedly 2,000 people can stand under its branches and be completely hidden. It looks like a small hill.

Next we flew to a small reservoir 20 miles away and did some low flying over water, then returned to Pretoria at about 100ft [30m] with the speedometer registering around 85 or 90 [measurement not specified! — Ed.], and I took a photograph of the wonderful Union Buildings, with their semi-elliptical façade and terraced gardens. This was the finish unfortunately, as there was no dual control so I couldn't fly the machine, but I thoroughly enjoyed those 45min of exhilarating flying. I thought Sandy was a damn good pilot, but in addition all officers of the SAAF have to qualify in some branch of the Army, so they know a good deal more about soldiering than we do, but less about the technical side of aeroplanes.

At 1010hr on March 14 we took off from Zwartkopp aerodrome to fly back to Pietersburg.



ABOVE, CLOCKWISE FROM LEFT *An improvised walking advertisement for a party to be held in honour of the RAF tourists at Broken Hill in Northern Rhodesia on the way down to Pretoria; the author in the front seat of the SAAF Airco D.H.9 flown by Lt Sandenburg — “Sandy”; and the author’s picture of Pretoria’s Union Buildings.*

We’d had the most wonderful time at Roberts Heights and it was very difficult to say goodbye and thank you with sufficient sincerity. Before we left, Sandy gave me the assegai shield he had picked up from a native who had been killed in tribal warfare, and of which I am very proud.

I should also like to place on record the technical work which was done for us. We had been troubled with cracking oil tanks and breaking tailstrut fittings. The advice of Warrant Officer McQueen in charge of the SAAF workshops was asked. On seeing the damage he immediately thought of a remedy and within three days had rendered all four Victorias fully serviceable, and we experienced no trouble for the rest of the cruise. They must have thought we were inefficient, arriving two days behind schedule with our aeroplanes falling to pieces.

We flew over the aerodrome and waved goodbye to the gaily coloured crowd which had assembled on the tarmac to see us depart. We avoided the city as we left because several formations of SAAF machines were flying around to welcome Prince George, who arrived at 1000hr. At 1210hr we landed at Pietersburg.

GOODBYE TO THE UNION

The next day, March 15, we set off for Bulawayo at 0740hr and arrived some three hours later, having crossed the Limpopo and said goodbye

to the Union. We were met by our friends from the club and issued with a programme of events. We spent the afternoon inspecting the aeroplanes and then went for a bathe. Bulawayo possesses the finest swimming bath in Africa, 60yd long by 30yd wide, equipped with first-class apparatus and surrounded by about two acres of well-kept lawns and terraces.

The next day we had a busy morning taking up men of the Rhodesian police force, and on the morning of the 17th we took up 165 officers and men of the 2nd Battalion of the Rhodesian Regiment and landed them on the Northern end of the aerodrome, where they made an attack on an imaginary hostile village. Then the Faireys of No 45 Sqn gave exhibitions of message-picking-up and formation flying, ending with two IIIFs performing a mock combat with Fg Off Shannon in his Victoria, which was “shot down in flames” unfortunately.

The following day was Sunday, so a further demonstration of Army co-operation was given for the benefit of those people who had been unable to see the previous day’s displays. In the afternoon we were all, officers and men, invited to a picnic by the Mayor. A fleet of about 50 cars set off for the World’s View in Matopos. The drive took us through a beautifully wooded valley about 30 miles [50km] into the hills, past prehistoric caves and granite boulders as big



ABOVE The remarkably clean interior of a Victoria (probably a factory-fresh example), looking aft. The type was originally designed to a specification drafted in 1920 for a troop-carrying aeroplane capable of carrying 25 fully-armed soldiers at 100 m.p.h. (160km/h) for 400 miles (640km). The prototype made its first flight in August 1922.

as a house. We arrived at the rendezvous well prepared for an arduous climb of about a mile to the World's View, where Cecil Rhodes is buried along with two other statesmen of the country.

On the 19th we bade farewell to all our kind friends and set out for Livingstone at 0800hr, keeping to the railway more or less the whole time. The country beneath us was an almost flat plain but the vegetation gradually changed from dried-up scrub to dense tropical jungle. At 0940hr we passed over Wankie [now Hwange], an important mining village which produces half the coal found in the country.

THE MIGHTY FALLS

The visibility was excellent, and it was at this time that I noticed a tiny cloud on the horizon. As we approached it became evident that it was spray rising from Victoria Falls, at least 70 miles [110km] away. We could discern the great Zambezi flowing across the plain; suddenly the whole river disappears into a chasm covered by a cloud of spray, from which it emerges and continues its course through a deep zig-zagging ravine, which cuts through the country for hundreds of miles as if fashioned by a gigantic knife. We flew over the falls at about 1,500ft

[450m] and I was able to obtain some first-class photographs. It was an unforgettable sight with a brightly coloured rainbow bridging the chasm.

At 1015hr we landed at Livingstone in Northern Rhodesia about ten miles from the falls. It must be remembered that the Zambezi forms the boundary between Northern and Southern Rhodesia. The next morning saw the arrival of the new Governor of Northern Rhodesia, Sir Hubert Winthrop Young, whose policy for colonial expansion is heavily tied to aviation. Imagine our horror when we awoke to find it pouring with rain, and the clouds at between zero and 200ft [60m].

We drove down to the aerodrome in our hired cars — an ancient Buick and a Chevrolet — and it was decided that the Victorias should go to meet his train and escort it back to Livingstone. The weather conditions were unaltered when we took off at 0945hr. Unfortunately, Shannon got stuck in the mud when taxiing and so we only had three machines in the air. We managed to join up in some sort of formation, and saw the train just as it was coming over the bridge below the Falls. The engine driver waved to us as we flew by and circled around the Falls. They were a terrifying sight; it was like looking into a white



ABOVE *One of the series of photographs taken by the author from his Victoria during the squadron's visit to Livingstone in Northern Rhodesia. It shows, appropriately enough, Victoria Falls and the distinctive arch of the Victoria Falls Bridge, which was opened in 1905 and straddles the border of what are now Zimbabwe and Zambia.*

hell as the chasm appeared and disappeared in the mist and spray.

We all managed to grope our way back to the aerodrome. Victoria No 1 succeeded in taxiing back to its original position, but Nos 2 and 3 stuck fast in the middle of the aerodrome. It was still raining as hard as it could and the weather showed no signs of clearing, so we had to abandon the aeroplanes until the ground dried up and became hard enough for us to move them. We returned to the hotel soaked to the skin but feeling satisfied with our efforts. The Governor's reception went flat, because the band couldn't play in the rain.

The next day was cloudy but dry so we dashed down to the aerodrome to dig out our aeroplanes. With the help of 50-odd convicts we constructed a trench in front of the mainwheels and laid down iron railway sleepers to make a runway. Then we tied a long rope to the undercarriage, on which the convicts pulled while Sorsbie opened up the engines and taxied gently out of the mire. I was rather astonished at the lack of fear of the aeroplane displayed by these natives in performing what was actually a rather dangerous task.

We taxied on to firmer ground, and undertook

emplaning practice with native troops of the Regiment. I considered they were the smartest native troops we met on the cruise; they created a record on our machine by emplaning and deplaning 19 troops in 45sec for each movement. We took them for a trip in the air, and only just escaped sticking again in the process. At first the troops were frightened and hid their faces in their hands; first, one looked out of the windows and then another until finally they were all laughing and pointing at objects which they recognised on the ground.

On landing the troops deployed and defended the aerodrome from attack by imaginary enemies. One section entered into the spirit of the game so completely that they captured two natives working in a nearby field, trussed them up and brought them back as prisoners thinking it was a great joke. This is typical of their outlook on life and soldiering in particular.



ACKNOWLEDGMENTS *This feature is based on the personal diaries and photographs of Gp Capt Shaw, kept in immaculate order by his daughter, Jilly McLaren, and her husband, Professor Ian McLaren; The Aviation Historian would like to thank them both for making the material available and their vital help with its preparation.*

A rare, if slightly out-of-focus, photograph of the "Vixettes" during a performance of the "Flight Deck" section of the Royal Tournament at the Earls Court Exhibition Centre in London, held during July 11–28, 1962. The aircraft look remarkably convincing and in all likelihood very few of the spectators noticed that the all-weather fighters on display were not what they appeared to be.

MIKE HOOKS



HERE COME THE VIXETTES

WHEN IS A SEA VIXEN NOT A SEA VIXEN?

At the 1962 Royal Tournament at London's Earls Court Exhibition Centre, visitors were treated to a display of four state-of-the-art de Havilland Sea Vixens being prepared for launch from the deck of a Royal Navy carrier. On closer inspection, however, all was not quite what it seemed, as naval aviation historian **MATTHEW WILLIS** reveals . . .



PROGRAMME: COLIN HIGGS COLLECTION



TOP RIGHT Either the world's smallest Sea Vixen or the world's biggest deck crew — the Royal Tournament "Vixette" display was filmed at Lee-on-Solent for the Rank Organisation's Look at Life series.

ABOVE The Royal Tournament was the largest annual military tattoo and service competition in the world during 1880–1999, and evolved into the British Military Tournaments held during 2010–2013.



THE AUDIENCE OF Britain's annual Royal Tournament in July 1962 was treated to a spectacular sight; a remarkably accurate re-enactment of HMS Hermes launching a squadron of the Fleet Air Arm's most modern all-weather interceptor, the de Havilland Sea Vixen FAW.1. The thrilled spectators would have seen armourers fitting de Havilland Firestreak missiles to the wing-mounted weapon pylons, fuel hoses connected, the engines started using a turbine starter and the crew climbing aboard, all while maintainers and armourers swarmed around the aircraft. The attention to detail was astonishing. As the crew fastened their harnesses, a maintainer pulled the locking pin from the ejection seat and handed it to the pilot. The aircraft taxied to the catapult bridle at the gestures of the batsman, their wings unfolding as they did so.

Fortunately for those who weren't able to be at Earl's Court on that day, the Rank Organisation filmed a special demonstration of that year's setpieces at RNAS Lee-on-Solent for its *Look at Life* series. The results are undoubtedly impressive, and show a great deal of effort to get things right. In fact, there was only one thing giving away the fact that this was not the real thing. The usually imposing Sea Vixens had apparently shrunk in the wash to around half their normal size. These all-weather fighters were in fact another type entirely, ingeniously disguised.

POCKET VIXENS

The exhibition centre at Earl's Court (the locality and its Underground station have an apostrophe but the exhibition centre, curiously, did not) could not accommodate aircraft of the size and weight of the Sea Vixen, and even if it could it would be highly challenging to use them in a demonstration. There were older and smaller aircraft available in abundance, but naturally the Royal Navy wanted to show its cutting-edge hardware at the British Forces' showcase event.

The Aircraft Holding Unit at Abbotsinch in Scotland was at the time host to a large number of de Havilland Sea Venoms awaiting disposal. A few of these had been borrowed by the engineers of No 12 Hangar to create weird and wonderful spoof aircraft for the station's air days, briefly fooling audiences into thinking they were seeing new naval



With no easy reference points by which to judge its size, Vixette "XJ602/247" is easily mistaken for the real thing, and is seen here at Lee-on-Solent in August 1963 with its outer wing panels removed. The real XJ602 was delivered to the Fleet Air Arm in October 1960 and was retired after an eventful career in late 1973.

MIKE STROUD

BELOW In one piece and bearing a pair of dummy Firestreak missiles on its starboard wing, Vixette "XJ603/246" provides an unusual sight for passers-by behind the fence at a Royal Navy base. There appears to be very little information regarding the true identities of the Sea Venoms — unless a TAH reader can provide chapter and verse!



AUTHOR'S COLLECTION

BELOW The genuine article — a pair of early production Sea Vixens take off in formation, the nearest, XJ490, carrying four Firestreaks on its underwing hardpoints, the furthest toting a pair of auxiliary fuel tanks. The Sea Vixen entered operational service with No 892 Sqn in July 1959, the Sea Venom leaving front-line service in 1960.

TAH ARCHIVE



Minus its outer wing panels, Vixette "XJ601/241" is seen here with at least one Firestreak on its port inner wing section (but not on the starboard side) in its position as a gate guardian at RNAS Lee-on-Solent. The station was designated HMS Ariel during 1959–65, after which it reverted to HMS Daedalus again. Curiously, serial XJ601 was never allocated to a real Sea Vixen, or indeed any aircraft.

AUTHOR'S COLLECTION



prototypes. It was understandable, therefore, for the station to be asked if it was possible to convert some of the surplus Sea Venoms into the likeness of a more modern type.

The engineers duly set about their task with enthusiasm, turning four of the aircraft into highly convincing miniature Sea Vixens, which they christened "Vixettes". The Sea Venoms gained an extended pointed nose, apparently formed from wood and canvas, a new rear fuselage giving the impression of twin jets, much more highly-swept wings, an offset cockpit (complete with radar operator's "coalhole") and deeper tailbooms with swept fins. The pocket Vixens were capable of moving under their own power, could accommodate two crew members (presumably in somewhat confined conditions) and had electrically-operated folding wings.

Two of the Vixettes appeared in the Rank film, named *Flight Deck*, one painted with the identity of a real Sea Vixen — XJ602/"247" — and one marked as XJ601/"241", both with the fin code "H". David Watkins's book *Venom: de Havilland Venom and Sea Venom — The Complete History* (The History Press, 2003), from which much of the above information was gleaned, and a photograph in the author's collection, reveal that a third aircraft was given the identity XJ603/"246", with the same fin code. The fourth, as we can see courtesy of our leading photograph, became XJ604/"245".

A ONE-OFF OCCASION

For the Royal Tournament, the Navy asked for volunteers to act as the deck crew for the demonstration. Bill Gibson, a stoker who served aboard carriers *HMS Ark Royal*, *Victorious*

and *Hermes* during a career which spanned more than 20 years, broke the longstanding Royal Navy tradition of never volunteering for anything, in order to take part. He and his fellow volunteers assembled at Lee-on-Solent for rehearsals, where they encountered the Vixettes.

"There were all sorts of trades there", Bill recalls. "They gave us all new roles for the Tournament. Captain J.D. Treacher was in charge — he later became an Admiral. We had a practice to get the timings right". This was important as the Vixettes did not move as conventional naval aircraft did. "They put a big electric motor in them," Bill reveals, "so they could move about. It worked on the concrete at Lee-on-Solent but when they got to the tournament, the surface was too soft and they couldn't move.

"In the end, they fixed the aircraft to a big rope and had a load of squaddies behind the scenes, pulling them about. When it got to the catapult, they pulled like mad and the aircraft shot forward. The lights were lowered, and the rope was dark, so you couldn't see it that well, and it all looked quite convincing."

After the Royal Tournament the assembled crew members went back to their regular roles, and it appears that the Vixettes were never used again in a live demonstration. At least two became gate guardians at Royal Navy bases, including "XJ601", which was photographed at Lee-on-Solent minus its outer wings, and "XJ603" at an unknown location.

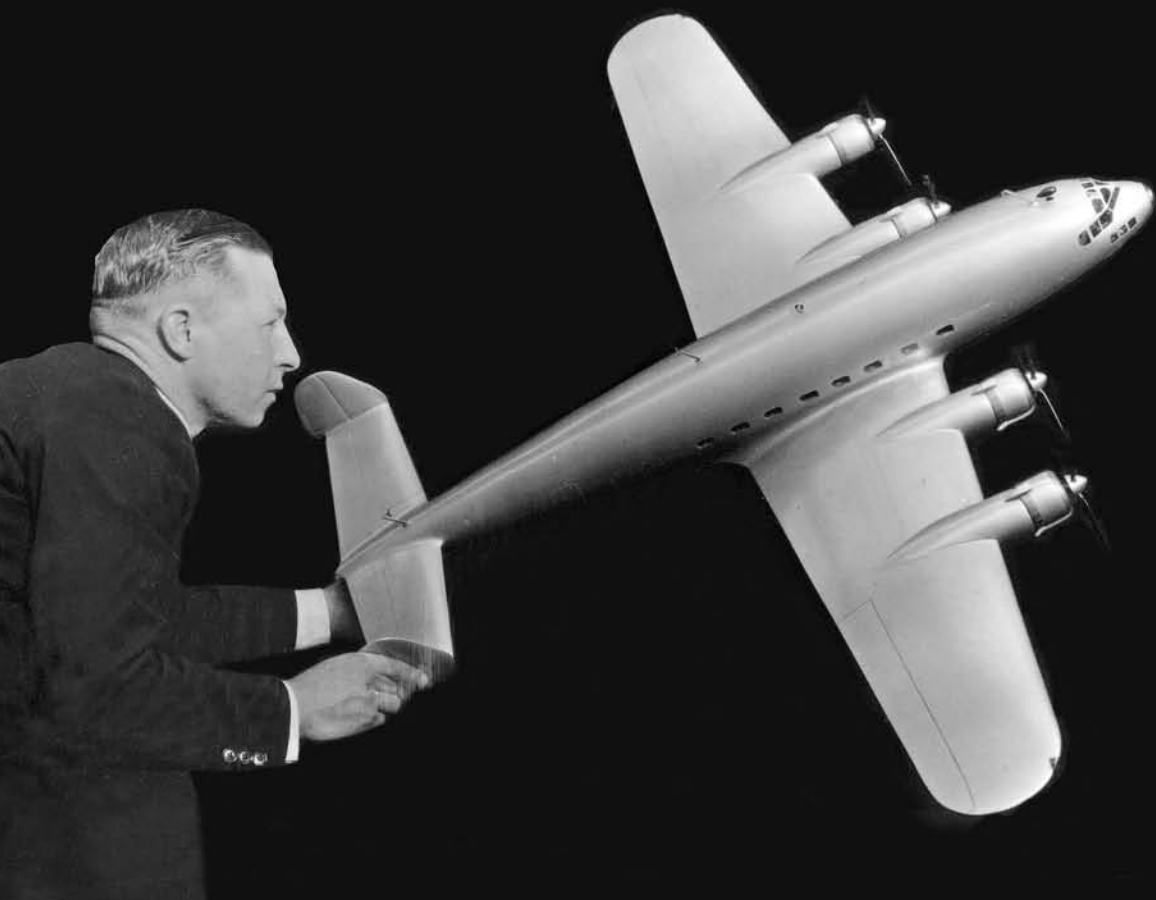
If any *TAH* readers can shed any more light on the creation of the Vixettes, the identity of the Sea Venoms they were converted from and their subsequent fates, do let the Editor know — we'd love to discover more!



FAIREY'S COMMERCIAL BREAK



By the mid-1930s all was not well in the world of British civil aviation, with antiquated biplane airliners trudging along the Empire routes while the Americans fielded fast, efficient all-metal monoplanes. Using original company documents, Fairey specialist BILL HARRISON explores the company's response: the ambitious but unbuilt "FC" series of pre- and post-war airliners



IN THE LATE 1960s Charles W. Cain, founder of Air-Britain, telephoned me to ask if I had a letter from Lockheed's Clarence "Kelly" Johnson, in which the latter admitted that he had incorporated some of the ideas put forward for the Fairey FC.1 airliner in the design of the American company's L-049 Constellation. Charles said that he had such a letter but could not place it and wondered whether he had sent it on to me, as the organisation's Fairey specialist. Unfortunately I did not see such a letter. But there is certainly a distinct similarity between the two types, work on the FC.1 commencing in 1938 and Constellation design starting the following year. I subsequently wrote to Johnson, who replied that he had not incorporated any ideas from the FC.1 — well, he would say that, wouldn't he?

So let the saga begin . . .

THE CADMAN REPORT

In November 1937 a committee was established in the UK under the chairmanship of Lord John Cadman to examine the state of British civil aviation, as well as investigate charges of inefficiency at the Air Ministry and staff issues within Imperial Airways. The findings of the committee's report urged the use of government funding for the development and production of internationally competitive commercial aircraft. The report, issued on March 8, 1938, was prefaced by 13 pages of introductory "observations" by the government, one of which pointed out that British constructors with lucrative military orders and those about to be awarded contracts under contemporary expansion schemes had shown little disposition to embark on costly ventures to produce civil aircraft, which would probably have to be terminated when war broke out. This stemmed from concerns voiced by the Directorate of Civil Aviation and the Air Ministry about how Britain was lagging behind in the development of civil landplanes. To remedy this, the report suggested, the Air Ministry should get together with commercial aircraft manufacturers and operators to specify a set of requirements and ask for design proposals, from which the most promising would be picked for production.

The report also recommended that civil aviation should receive increased government support and funding, suggesting that it was a lack of finance that was holding back Britain's ability to develop competitive modern airliners. It went on to state that the government could be more helpful to civil aviation and that a specialised department should be established with its own

under-secretary. Imperial Airways, the report continued, should concentrate on the Empire routes, while British Airways Ltd, using British aircraft, should fly to the principal European cities. Furthermore, British Airways should immediately seek government subsidies for the establishment of routes to the Caribbean, Pacific and South America. There was also a need for greater co-operation between civil and military aviation and for more research to be undertaken.

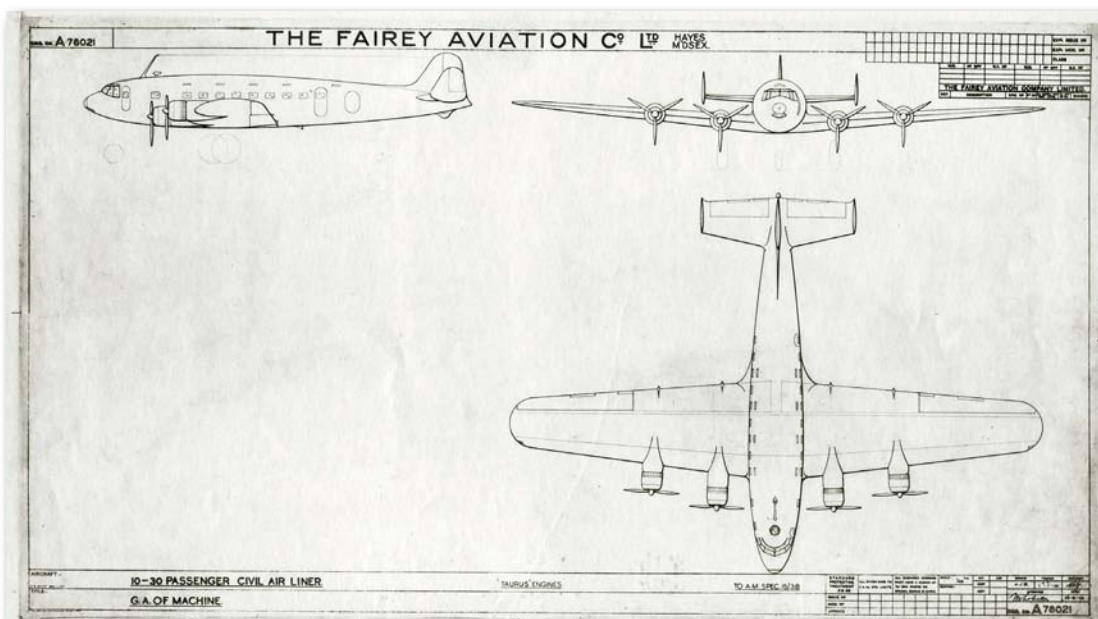
Taking heed of the report, the government set up the Directorate of Civil Research & Production (DCRP), which secured funding for two new airliners; the Short S.32 and Fairey FC.1. The former was already being worked on in response to an Air Ministry specification which called for a long-range monoplane to replace the Armstrong Whitworth Ensign, already proving unsuitable for the task for which it was intended. Trials of both aircraft would lead to a decision as to which would be selected for Imperial Airways.

In the wake of the Cadman report, and with unusual promptitude, outline Specification 15/38 was issued for a "10–30-seater Civil Airliner" and despatched to Armstrong Whitworth, Bristol, Fairey, General Aircraft Ltd (GAL) and Vickers on May 17, 1938. A covering letter explained that financial assistance was available, including contributions for prototype development and production tooling. It also asked for prospective rates of production, delivery dates and the degree of financial help likely to be required. One important proviso was that related effort must not interfere with urgent work on military types. Tenders were required within seven weeks.

Vickers was quick to decline the invitation, followed in July by Armstrong Whitworth. Bristol, Fairey and GAL accepted, as did Folland, which had also been invited to tender later. In July Specification 14/38 was issued for a long-haul aircraft suitable for transatlantic operations, which would become the Short Bros aircraft.

Specification 15/38 called for "a four-engined all-metal monoplane civil airliner" with a gross weight of around 42,000lb (19,000kg) and structural provision for pressurisation — radical thinking indeed for the day. The aircraft was to be capable of clearing a 66ft (20m) screen in 1,000yd after engine failure and to operate over a still-air range of 1,000 miles (1,610km) on three engines delivering 70 per cent of their rated power. Stalling speed at maximum landing weight was to be no greater than 68 m.p.h. (109km/h). An automatic pilot was to be fitted, as was an anti-icing system. The aircraft's landing approach characteristics

OPPOSITE PAGE *A scale model of the Fairey FC.1 is held aloft by John W.R. Taylor, who worked for the company in his early years before going on to become one of the UK's most distinguished aviation authors. Of ultra-modern design, the FC.1 is seen here without the central fin added at a later stage.* ALL IMAGES VIA AUTHOR UNLESS OTHERWISE STATED



ABOVE An original Fairey general arrangement drawing of the FC.1 with Bristol Taurus engines to Air Ministry Specification 15/38, dated July 1, 1938. The first choice of powerplant for the FC.1 had been the Rolls-Royce Exe, an X-type sleeve-valve engine, but the company suspended its development to concentrate on Merlin production.

had to be suitable for an instrument approach using the Lorenz system.

Unsurprisingly, the resulting designs from the four manufacturers were similar in outline. Fairey submitted proposals and drawings on July 4, 1938, offering an attractive design with a span of 105ft (32m), a length of 76ft (23.2m) and a height of 22ft 6in (6.85m) to the tip of the rudder. The tailplane span was 30ft 6in (9.3m). At an all-up weight of 45,218lb (20,500kg) the aircraft was expected to cruise at 275 m.p.h. (443km/h) at 11,000ft (3,350m), with a range of 1,850 miles (2,965km). It would carry 1,600gal (7,273lit) of fuel and have a service ceiling of 25,000ft (7,620m). These figures were based on the findings of Robert T. Youngman, head of the Fairey Technical Department.

The new aircraft was to be powered by the untried Rolls-Royce Exe, a pressure-air-cooled 24-cylinder X-type engine rated at 1,200 h.p. at 4,000 r.p.m. This engine was a strong contender, as it was also proposed for Fairey's Barracuda torpedo-bomber for the Fleet Air Arm. When work on the Exe was suspended in the summer of 1939, the alternative selected for the new airliner was the 1,000 h.p. Bristol Taurus sleeve-valve engine, and it was this that featured in most of the company's promotional brochures.

Other engine candidates included the Bristol Hercules, Wright GR-1820-G102A Cyclone with NACA cowlings, Wright F.62 (as preferred by British Airways) and Wright G.100. The propellers were to be fitted with slinger rings *la tubular ring* around the hub of an aircraft propeller through which anti-freeze solution is spread over the propeller

blades by centrifugal force — Ed.] and staggered so that ice thrown off the blades would not hit those of the others. The undercarriage was of tricycle configuration, the mainwheels retracting inwards into the wing roots, the nosewheel retracting rearwards into a well below the floor of the cockpit. A small tailwheel was to be fitted to prevent damage to the rear fuselage in case of over-rotation on take-off.

The new airliner's total useful load of around 10,100lb (4,980kg), when added to the aircraft's gross weight of 37,930lb (17,200kg), exceeded the original specification of 42,000lb (19,050kg). The design was to incorporate pressurisation to allow the aircraft to cruise at 15,000ft (4,600m). This would be achieved by fitting compressors to two of the four Taurus engines, each compressor capable of providing twice the amount of air required. The loss of one engine would therefore not be critical to maintain pressurisation. The new long-range airliner was expected to be available in 1940.

THE ECONOMICS

Although there were to be many changes to the financial proposals put forward, Fairey estimated airframe development costs for the new type at £120,000–£140,000 plus powerplants over a short run, lowering to £50,000–£60,000 plus powerplants over a run of approximately 100 aircraft. According to an Air Ministry fact-finding mission, the Douglas DC-4 was being offered at £78,000 per aircraft predicated on an order for 20 machines; Boeing was offering its Model 307 at £68,000; the Junkers Ju 90 came in at £50,000



ABOVE A promotional photo-montage of a model of the FC.1 “in flight” over a generic cloudscape. By this stage the airliner has had a central fin incorporated but still has a deep cockpit window configuration. By the time work on the mock-up started, a more streamlined windscreen arrangement with smaller windows had been designed.

and the Focke-Wulf Fw 200 Condor at £40,000. There would not be much in it. Indeed, the sum of £80,000 had been tentatively allocated against a unit price for the selected aircraft to Specification 15/38 out of a total of £375,000 put aside for civil aircraft development in 1938.

In August 1938 a new department recommended by the Cadman committee — the Directorate of Civil Aviation & Production, under Sir Francis Shelmardine and the new director of the DCRP, Maj C.J. Stewart — made a technical assessment of the four designs put forward for Specification 15/38. To simplify the assessment the pair analysed the four designs by putting each “on paper” with Bristol Taurus engines, a tricycle undercarriage and using similar fuel tankages. Predictably, performance and weights turned out to be similar for the four designs, but the GAL.40 design edged into the lead on overall technical merit. These were still only “paper aeroplanes”, however, and Shelmardine and Stewart were very much in favour of getting Fairey into the civil aircraft manufacturing business. Also, at the first selection meeting on August 9, 1938, British Airways’ Operations Manager, Alan Campbell-Orde, made it quite clear that his airline would find it difficult to place any orders with anything but a large and experienced manufacturer.

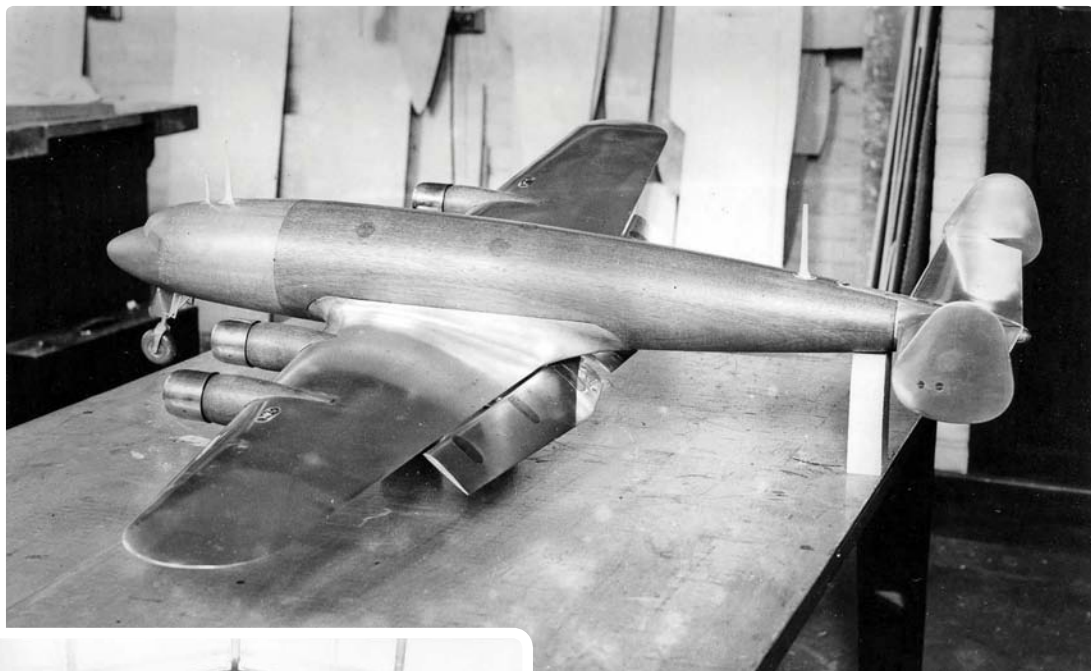
The Air Ministry asked the four contenders if they would be prepared to proceed with the production of 20 aircraft if the whole cost of prototype construction and development was carried by the government — and, if not, whether they would be prepared to do so if jigging and tooling were also paid for. Fairey replied that

it would go ahead if the prototype costs were covered, based on an initial run of 20 aircraft. Fairey estimated that it would need a total of £1,638,000, of which £160,000 would be paid for prototype work and allowing £73,900 for each of the 20 production machines.

Now for the proverbial spanner in the works. It was agreed that two prototypes would be required, but British Airways, which was now involved in technical discussions regarding the Specification, stated that it had a requirement for only 12 such aircraft, rather less than the original 20 mooted. Furthermore, the airline claimed that it was not in a position to place an order and that the FC.1 was not suitable for its longer routes. However, on November 12, 1938, following Treasury approval, an offer was accepted by Fairey, which agreed to proceed with construction of the Fairey Commercial No 1 (FC.1). A sum of £225,000 was allocated for the production of two prototypes, plus £80,000 for each aircraft, plus tooling support, for a total of 14 FC.1s, a revised figure received from British Airways.

CONSTRUCTION BEGINS . . . AND ENDS

Fairey got off the mark straight away with an excellent timber-and-fabric mock-up, which was shown to the aviation press in early 1939. The company’s founder, Richard (later Sir Richard) Fairey, also saw other possibilities for the FC.1, one of which was a military transport variant, the FC.1M, which could be built in parallel with the airliner. Fairey’s personal view was that it would be essential for Britain’s armed forces to have a modern transport aircraft in which to move

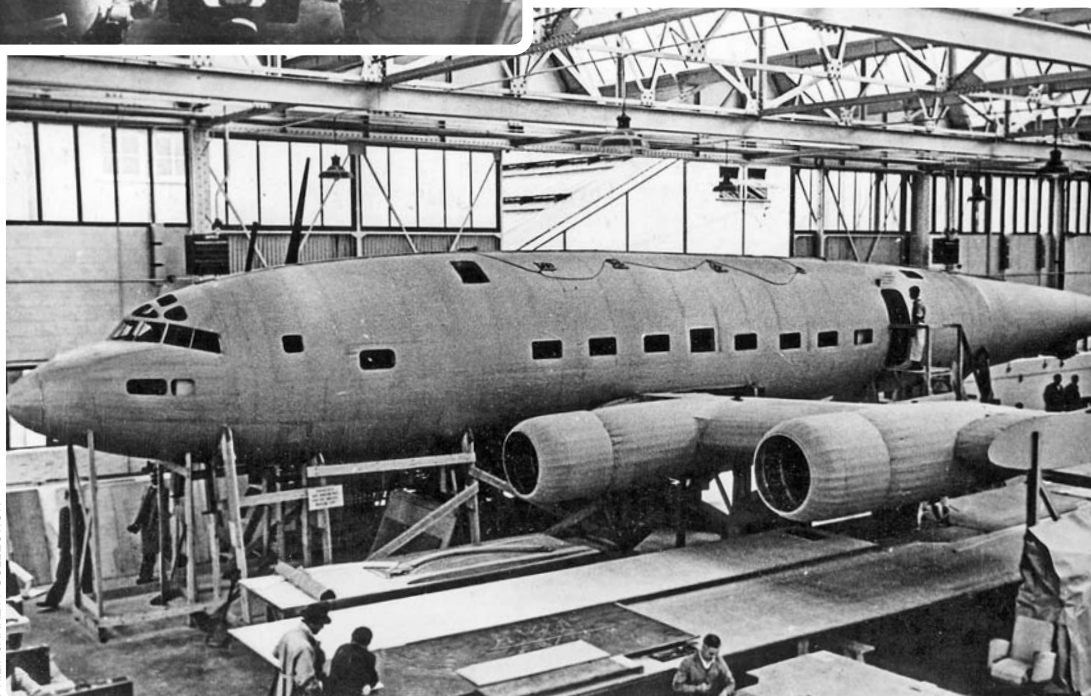


PHILIP JARRETT COLLECTION

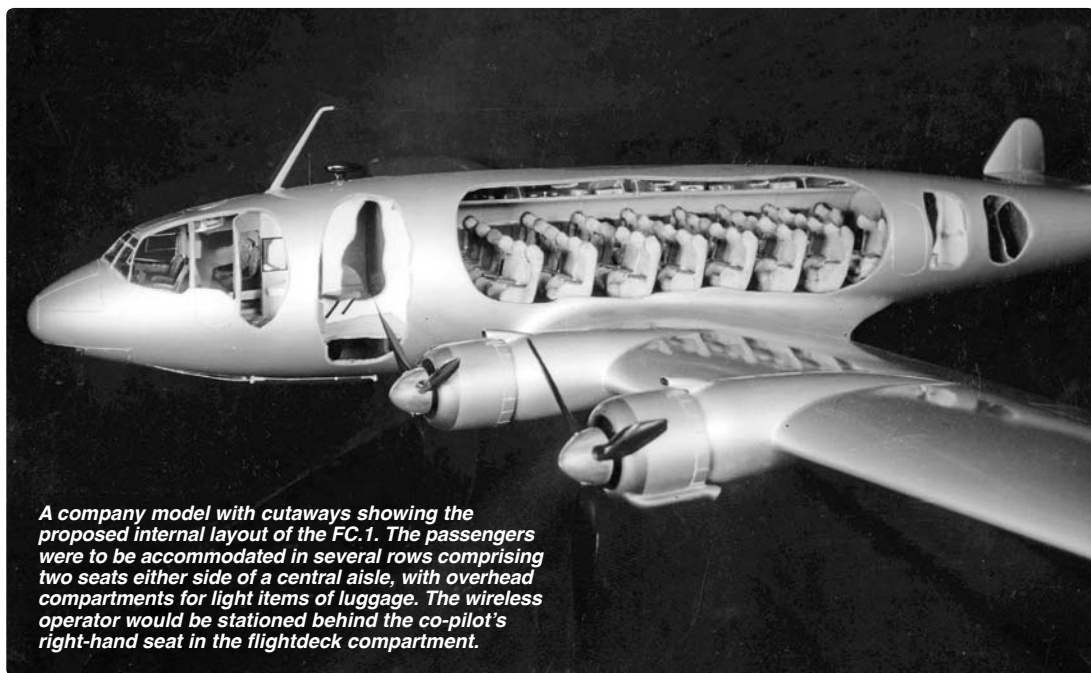
ABOVE Windtunnel tests of the FC.1 were undertaken with this beautiful handmade model, seen here without a central fin and with the Fairey-Youngman flaps extended. The model incorporates a tricycle undercarriage, although a tailwheel arrangement was also considered.



LEFT & BELOW By the spring of 1939 the FC.1 mock-up was nearing completion in the company's experimental workshop at Hayes and incorporated flight instrumentation in the cockpit, including the central control pedestal and a Sperry autopilot panel.



PHILIP JARRETT COLLECTION



A company model with cutaways showing the proposed internal layout of the FC.1. The passengers were to be accommodated in several rows comprising two seats either side of a central aisle, with overhead compartments for light items of luggage. The wireless operator would be stationed behind the co-pilot's right-hand seat in the flightdeck compartment.

troops around the world. However, he had not reckoned with the conventional wisdom of the time and the ways of ministers, who could not see that it was possible for a civil airliner to double as a military transport. The Secretary of State for Air, Sir Kingsley Wood, issued a personal reply to Fairey, stating that it was not possible to complete a civil airliner as a military transport.

Fairey then submitted plans to Shelmerdine, the Director General of Civil Aviation, for a larger, long-range version of the FC.1. With production drawings available, conversion to the larger version would have been relatively simple and would also serve the RAF's commitments around the world admirably. Fairey was devastated when Shelmerdine cancelled the FC.1 on October 17, 1939, construction of the prototype stopping completely in May 1940. Fairey was instructed to strip its civil aircraft assembly shop and place all completed parts and jigging in storage at the rear of the factory for the duration of the war.

Thus the development of a highly promising British airliner ceased, much to the detriment of the nation's civil aircraft industry. Despatched to Washington DC as a member of the Air Section of the British Purchasing Commission, Richard Fairey experienced the intense frustration of watching the Americans develop four-engined tricycle-undercarriage aircraft such as the DC-4 and Constellation into world-class military transports. He did, however, send an order back to his own company in the UK to keep the files on the FC.1 open. This the company did and in late 1945 the FC.1 was redesigned, to be powered by four Bristol Hercules sleeve-valve engines. The project was never revived, however.

So what would this elegant, forward-looking design have looked like and how was it to have been built?

THE DETAILS

The fuselage of the FC.1 was to be made up of three detachable units of an all-metal light-alloy-sheet (Alclad) monocoque construction. The forward portion reached from the nosecone to the bulkhead at the forward end of the passenger cabin and included the flightdeck, flight engineer's and wireless operator's stations, forward freight compartment and the crew lavatory. The wireless operator, located behind the second pilot, would be responsible for the operation of short- and medium-wave transmitters and receivers, a medium-wave direction-finding (DF) receiver with loop and VHF landing and approach receiving equipment.

The central portion comprised the passenger cabin, with the space between the cabin floor and outer skin constructed as an additional freight area. The passenger cabin was 30ft 6in (9.3m) long and accommodated rows of twin seats, with a total width of 4ft (1.2m), on each side of a central aisle. Eight windows were incorporated on each side, every alternate window doubling as an emergency exit which could be pushed out. Headroom was to be 6ft 6in (2m) with a volume of space per passenger of no less than 60ft³ (1.7m³). The fuselage was to be of circular cross-section, which offered the possibility of the addition of a pressure cabin at a later date.

The rear portion extended to the empennage and included a rear freight compartment with access provided through the freight compartment to the



ABOVE Another photo-montage of the FC.1 "in flight", looking very much like a cross between the shapely de Havilland Albatross airliner, which first flew in May 1937, and the triple-finned American Lockheed Constellation, the design of which did not start until 1939, and which made its maiden flight in January 1943.

LEFT Following the bruising cancellation of the FC.1 in October 1939, Richard Fairey was selected to join the Air Section of the British Purchasing Commission, which was in need of a well-respected figure with wide practical and managerial experience to co-ordinate design, development and production procedures between the UK and the USA. He did not return to the UK until after the war.

rear portion to facilitate maintenance. Luggage and freight was to be carried in 150ft³ (4.3m³) and 160ft³ (4.5m³) holds, with extra stowage space of 200ft³ (5.7m³) available under the cabin floor. A de-icing tank was to be situated on the upper starboard side of the rear portion.

The two-spar wings were of stressed-skin all-metal construction and incorporated inner and outer sections. The inner carried the flaps and engine nacelles, the latter of which were to be self-contained interchangeable units, similar to the "power egg" principle. The main fuel tanks of 1,800gal (8,172lit) capacity were to be installed in the inner wing section, with two tanks between the spars and one in the leading edge, all readily removable for maintenance. The trailing-edge portion of the wing, together with the flaps, was to be readily detachable from the rear spar.

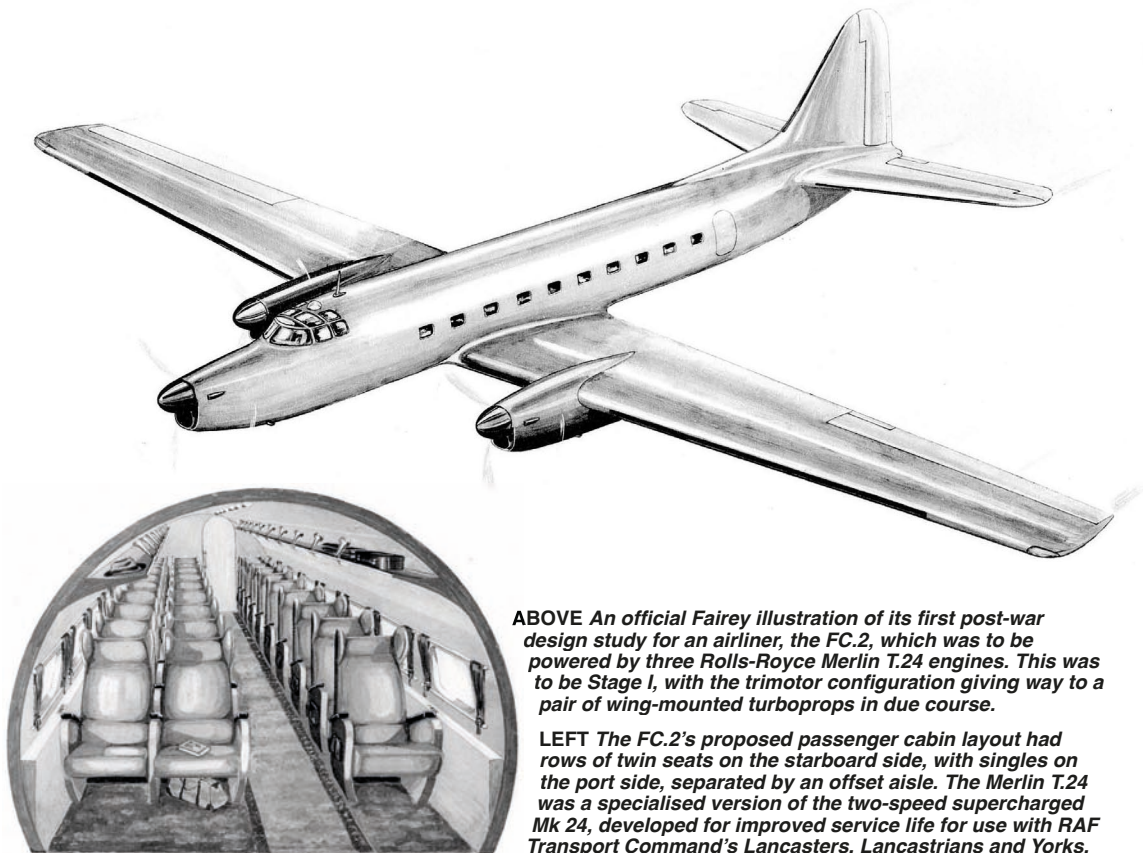
The skin of the outboard wing section was constructed with watertight joints so that these sections would become buoyancy chambers in case of ditching. The ailerons consisted of fabric-covered metal spars and ribs. The hydraulically operated Fairey-Youngman flaps were of all-metal construction and operated by an engine-driven pump, although a hand-operated pump was also provided in the cockpit for emergency use. These flaps were designed to give high lift with low drag, and were to be mounted on a system of links that allowed their lowering from

the retracted position to a position below the rear portion of the wing, giving an auxiliary aerofoil of about one-third of the chord of the wing. This would provide high lift at take-off without significantly affecting the lift/drag ratio. With this new flap lowered to zero incidence the lift/drag ratio of the bare wing was approximately maintained and the take-off distance reduced by about 20 per cent. For landing, the flaps were set at the maximum-lift setting of 30°, which would give a gliding angle suitable for a blind-approach landing using the beacon system.

The tail unit consisted of triple fins and rudders which provided excellent directional control and good anti-spinning qualities. The fully cantilevered tailplane was of light-alloy stressed-skin construction. The tailplane and fins were not adjustable but the elevators and rudders were provided with trimming tabs operated by the pilot. The rudders and elevators incorporated fabric-covered metal spars and ribs. All in all, the FC.1 was a well-conceived design incorporating many of the most modern techniques.

A POST-WAR OPPORTUNITY?

As the war in Europe drew to a close, Fairey began to take an interest once again in the civil aircraft market. During the war Fairey's Basic Design Group had occasionally undertaken design exercises based on airliner projects, with



ABOVE An official Fairey illustration of its first post-war design study for an airliner, the FC.2, which was to be powered by three Rolls-Royce Merlin T.24 engines. This was to be Stage I, with the trimotor configuration giving way to a pair of wing-mounted turboprops in due course.

LEFT The FC.2's proposed passenger cabin layout had rows of twin seats on the starboard side, with singles on the port side, separated by an offset aisle. The Merlin T.24 was a specialised version of the two-speed supercharged Mk 24, developed for improved service life for use with RAF Transport Command's Lancasters, Lancastrians and Yorks.

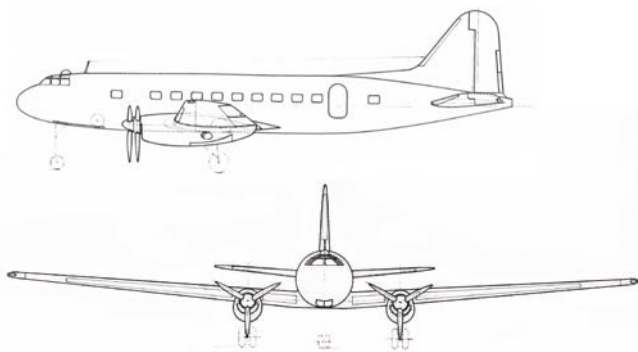
a view to putting forward an attractive design when the right combination could be found for a marketable product. On this they were guided by the work of various new committees, including the Brabazon Committee, established in late 1942 to devise a strategy for Britain's post-war civil aviation development, part of which would be to prepare an "outline specification for several aircraft types needed for post-war air transport". Significantly, part of the committee's work would be to consider which civil aircraft could best be converted into military transport aircraft. Here was the endorsement Richard Fairey had been looking for only four years previously.

In the immediate post-war period, Fairey began studying general trends in the airliner market and concluded that in the medium-sized airliner category, a 30-passenger type of around 40,000lb (18,100kg) would fulfil the market's needs. Based on its availability, the first choice for a suitable powerplant was the homegrown tried-and-trusted 1,610 h.p. Rolls-Royce Merlin T.24-2, with a Bristol engine as a contingency. For the USA and world market the Wright Cyclone was envisaged, although it was also acknowledged that the reciprocating engine would give way to the gas-turbine (turboprop) within a few years and that radical alterations to the design to accommodate this should be reduced to a minimum.

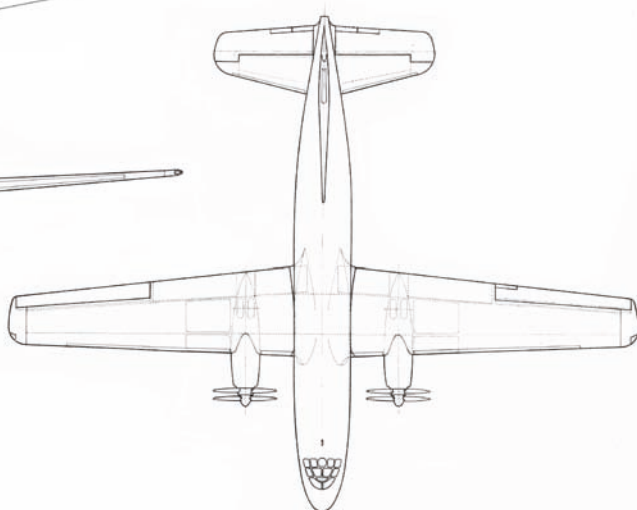
Fairey's initial design study incorporated three

Merlins; one on each wing and one in the nose of the aircraft, each mounted on a rubber-insulated structure. The wing-mounted engines' propellers were to be located opposite a "blanked" portion of the passenger cabin, which, with additional soundproofing, would reduce noise and vibration. The company further postulated that a 30-seat airliner with an all-up-weight of approximately 42,000lb (19,000kg) powered by three interchangeable Merlin engines would be Stage I, to be followed by a twin-engined machine powered by a pair of Armstrong Siddeley Double Mamba turboprops as Stage II — or the FC.3, as it became known. Fairey anticipated that, given the go-ahead, the first prototype would be ready within 22–26 months.

The Stage I (FC.2) design was an attractive low-wing light-alloy monoplane incorporating a tricycle undercarriage and a pressurised cabin. It was designed to be of the lightest possible weight to offer the maximum disposable load with the best handling and the safest take-off and landing characteristics. There was to be ample space for passengers, with a three-abreast layout providing 53ft³ of space per passenger. A compartment for luggage and other light freight items was located on the starboard side of the flightdeck behind the navigator's station, with a loading door incorporated in the forward fuselage. Additional space would also be available under the cabin floor.



The FC.3, or Stage II development, was essentially the FC.2 fitted with a pair of Armstrong Siddeley Double Mamba turboprops operating through a common gearbox and driving contra-rotating propellers. Fairey had played a major part in the development of the Double Mamba, and the powerplant saw extensive service in Fairey's Gannet anti-submarine aircraft, which made its first flight in September 1949.



Two versions of the FC.2 were offered, one non-pressurised for shorter low-altitude routes and a pressurised version for high-altitude routes. The air supply in the latter would be provided by two Marshall cabin blowers driven by the wing-mounted engines. The pressurisation system would maintain ground-level conditions up to 12,500ft (3,870m), after which it would change progressively up to an altitude of 25,000ft (7,600m), at which the internal cabin pressure would be maintained at the normal atmospheric pressure of 8,000ft (2,400m).

The FC.2 airframe was to be of circular cross-section and of light-alloy semi-monocoque construction, combining simplicity of design with ease of maintenance. The wings and empennage were to be of orthodox two-spar construction, with a de-icing system applied to the wings, propellers and tail unit. The crew was to comprise a pilot, copilot and radio/navigator, accommodated in a standardised cockpit with the navigator located behind the copilot. Two crashproof fuel tanks were to be installed outboard of the engine nacelles with another two in the leading edge of the wings, their combined total capacity being 950gal (4,319lit). Each engine was supplied by a 15gal (68lit) oil tank.

The FC.2's mainwheels were to have twin bogies for reasons of safety. The control surfaces were to be metal-covered. Rearward-facing seats offering additional safety could be offered to prospective customers. Ten oblong clear-vision passenger windows were to be incorporated, every alternate window doubling as an escape hatch. A door in the port rear fuselage provided easy access to the cabin. A special latch and hinge arrangement, used in conjunction with a pneumatic pressure-sealing system, would allow the door to be jettisoned in an emergency.

Surprisingly, in-flight refuelling equipment was to be installed as standard, the coupling unit being installed at the rear end of the fuselage, a capability then being offered on all airliners being developed in Britain. In March 1947 detailed brochures for the FC.2 were prepared and submitted to the Air Ministry for approval.

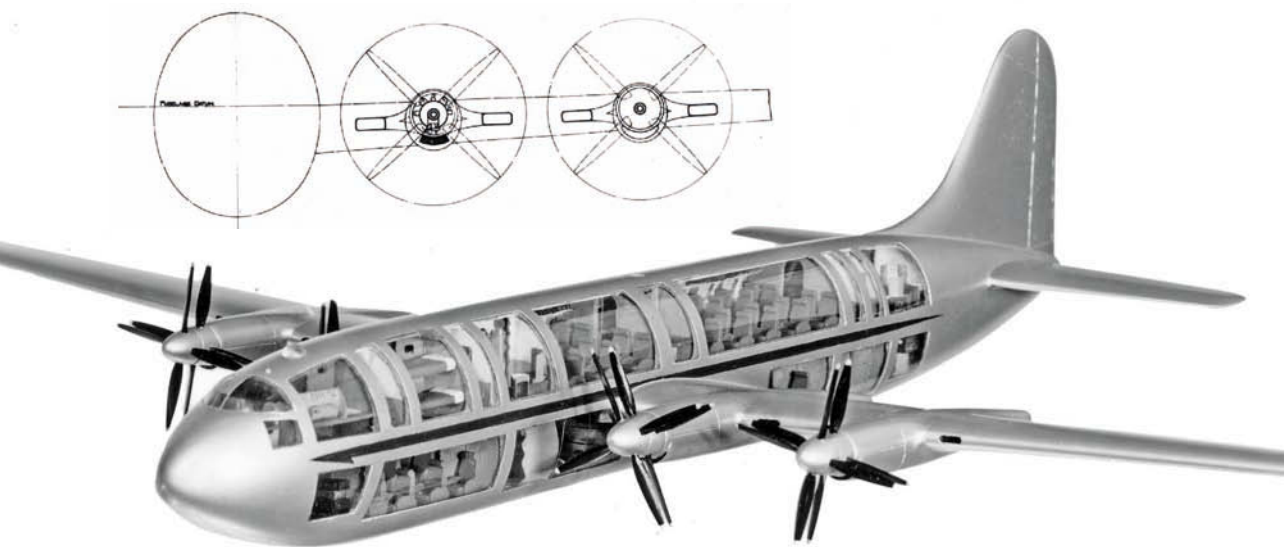
ENTER THE TURBOPROP

The FC.3 was intended as an alternative to the FC.2, incorporating two 1,310 e.s.h.p. Armstrong Siddeley Double Mamba powerplants. These would be installed on the wings in place of the Merlins, the nose-mounted engine being deleted. Fuel capacity was to be 1,155gal (5,250lit) with 4gal (18lit) of oil. The FC.3 would carry the same number of crew and passengers as the FC.2, the fuselage aft of the front cabin bulkhead, together with the wings and empennage, being unaltered.

The forward fuselage would incorporate a faired nose with an additional section of fuselage inserted between the flightdeck and the blanked section of the fuselage. The rear row of seats was to be omitted and the rear bulkhead moved forward to close the space.

The Double Mamba comprised two Armstrong Siddeley Mamba turboprops mounted side-by-side with a common gearbox containing two sets of reduction gears to drive, by means of automatic and hydraulically operated clutches, a pair of contra-rotating propellers. It was intended that, once airborne at cruising altitude, one half of each engine could be shut down to conserve fuel.

In July 1947 a Specification was put to the International Civil Aviation Organisation (ICAO) Committee in a joint paper by the Ministry of Civil Aviation (MoCA) and the Ministry of Supply (MoS) for a new airliner project. When BOAC assumed responsibility for all international



routes from and to Britain (but excluding Europe and South America), all development of large medium- and long-range airliners was tailored towards the requirements of the national flag carrier. Specifications for many future design requirements had been drawn up by the Brabazon Committee, but it was felt there was a number of gaps within the framework and that further designs would be required. This provided Fairey with an opportunity to submit its designs for a "Medium-Range Empire Aircraft" under Specification 2/47.

It was not to be, however. The Specification set out a requirement for a four-engined aircraft with accommodation for 42 passengers, a design speed in the region of 300–350 m.p.h. (485–565km/h), a payload of 13,300lb (6,030kg) and a range of 1,890 miles (3,040km). Powerplant options included the Rolls-Royce Clyde, Bristol Proteus and Armstrong Siddeley Python, all of which were turboprops developed for military aircraft projects. These tenders were to act as an insurance against the failure of the jet-powered de Havilland Comet and to supersede the Brabazon III project, which called for a four-engined landplane for Empire trunk routes. (Type IIIA specified an aircraft for North Atlantic routes; Type IIIB for a medium-range aircraft for trunk routes.)

On July 14, 1947, a joint committee made up of representatives from the MoS, MoCA and BOAC announced that the Bristol 175 (later named the Britannia) was the best design to Specification 2/47, and the designs submitted by Armstrong Whitworth, Avro, Blackburn and Handley Page were all rejected. The Fairey airliner design had not even been considered.

The following year Fairey submitted a brochure to the Air Ministry in response to Specification 5/48, which called for a "Civil Air Liner for

ABOVE A foretaste of the 21st-century double-deck Airbus A380, the Fairey Queen (as the FC.4 to FC.6 were collectively known) was to accommodate up to 58 passengers in a two-tiered "double-bubble" fuselage. The powerplants were to be accommodated in highly streamlined nacelles, as seen in the head-on view of the FC.4 in the Fairey illustration at TOP.

the Long Range Empire [LRE] and North Atlantic Routes". Offers to six companies were tendered, including Fairey, which offered three similar four-engined designs; the FC.4, FC.5 and FC.6, all featuring a mid-mounted wing layout. The airframe was to be constructed on semi-monocoque principles in order to combine simplicity of design with adequate strength and stiffness. The four engines were to be interchangeable and enclosed in a self-contained streamlined nacelle secured to the wing structure by quickly detachable joints at the powerplant's rear bulkheads. Leading-edge intakes would feed air into suitably designed plenum chambers fitted around each engine's compressor inlet. The jetpipes were to be led through the mainspar and terminate just beyond the wing's trailing edge.

The single-spar wing construction was to be supplemented by a rear-spar diaphragm to complete the torsional shear path and to deal with drag load moments. The undercarriage was to comprise a pair of twin mainwheels on oleo legs mounted side-by-side and pivoted on the wing structure in a manner that allowed them to retract sideways, one leg inboard and the other outboard, thus enabling the mainwheels to lie flat inside the wing. The mainwheels were designed for a vertical descent rate of 14ft/sec (4.2m/sec). Hydraulic power-assisted controls were to be fitted to the ailerons, elevator and rudder.

A 12ft 5in (3.7m)-wide, 15ft 3in (4.5m)-tall two-tiered deck of faired "double-bubble" cross-



ABOVE Another view of the *Fairey Queen* model, which highlights the design's clean lines and high-aspect-ratio wing. Various powerplants were mooted for the design, chiefly the Bristol Proteus which powered the Bristol Britannia airliner and Saro Princess flying-boat, and the Napier Nomad turbo-diesel with contra-rotating propellers.

section was to be incorporated. A Normalair pressurisation system was to be included to maintain sea level conditions up to 15,500ft (4,700m), with a progressive reduction in pressure to give the equivalent pressure at 8,000ft (2,400m) at 30,000ft (9,100m). The main differences between the three types were in span, fuselage length and engine choice.

THE FAIREY QUEEN EMERGES

The aircraft was to be known as the *Fairey Queen*, of which there would be several variants, including the following:

- **FC.4** A Bristol Proteus turboprop-powered "Super Luxury Aircraft" for 30–56 passengers;
- **FC.5** Same as FC.4 but powered by Napier Nomad turbo-diesel compound engines;
- **FC.6** A Proteus-powered "Standard Luxury Aircraft" for 30–58 passengers.

Each of these types was convertible to sleeping accommodation for night flying, the suffix letter D or N being appended to denote a day or night configuration. Alternative sleeper arrangements were proposed; one for 21 passengers in separate self-contained cabins, and another for 24 passengers in convertible day seats.

Fairey allowed for a crew of 11, or 13 on especially long trips. A normal basic crew consisted of Captain, First Officer, Radio Operator, Navigator, Flight Engineer, two stewards and one stewardess, with the rest of the crew in a rest room. The crew's entrance was to be incorporated in the forward freight door on the starboard side with access to the upper deck being gained by a ladder leading directly to the flightdeck.

Wanting the most attractive design regarding passenger disposition for the long routes to Australia and South Africa, Fairey considered the following designs:

- A low-wing monoplane with a single-deck fuselage of 13ft (4m) diameter;
- the same with a single-deck fuselage of 11ft (3.35m) diameter;
- a mid-wing monoplane with a double-deck arrangement;
- the same with very spacious accommodation.

Fairey concluded that the double-deck schemes with a mid-mounted wing of straight taper and high aspect-ratio would be more favourable, and used this layout as the basis for further design studies. A unique feature of the double-bubble fuselage was a ready-made and accessible



FAIREY COMMERCIAL AIRCRAFT DATA

| Type | FC.1 | FC.2 | FC.3 |
|----------------------|-----------------------|-----------------------|-----------------------|
| Dimensions | | | |
| Span | 105ft 0in (32m) | 103ft 0in (31.4m) | 103ft 0in (31.4m) |
| Length | 76ft 0in (23.2m) | 80ft 8in (26.5m) | 80ft 4in (26m) |
| Height | 22ft 6in (6.9m) | 26ft (7.9m) | 26ft (7.9m) |
| Passengers | | | |
| | 10–30 | 24–30 | 24–30 |
| Weights | | | |
| Empty | 28,000lb (12,700kg) | 27,755lb (12,589kg) | 25,240lb (11,448kg) |
| Maximum | 45,232lb (20,516kg) | 41,000lb (18,597kg) | 40,630lb (18,429kg) |
| Performance | | | |
| Cruise speed | | | |
| at 10,000ft (3,000m) | 275 m.p.h. (443km/h) | 275 m.p.h. (443km/h) | 300 m.p.h. (483km/h) |
| Time to climb | | | |
| to 10,000ft (3,000m) | 8min 50sec | 8min | 6min 30sec |
| Service ceiling | 25,000ft (7,250m) | 30,000ft (9,100m) | 40,000ft (12,200m) |
| Range | | | |
| at 10,000ft | 1,850 miles (2,980km) | 1,650 miles (2,650km) | 1,540 miles (2,480km) |

| | FC.4 | FC.5 | FC.6 |
|----------------------|-----------------------|-----------------------|-----------------------|
| Dimensions | | | |
| Span | 163ft 0in (49.7m) | 163ft 0in (49.7m) | 158 ft 6 in (48.1m) |
| Length | 118ft 0in (36m) | 114ft 0in (34.7m) | 99ft 9in (30.2m) |
| Height | 34ft 8in (10.4m) | 34ft 8in (10.4m) | 34ft 8in (10.4m) |
| Passengers | | | |
| | 30–56 | 30–50 | 30–58 |
| Weights | | | |
| Empty | 67,560lb (30,644kg) | 70,060lb (31,778kg) | 61,800lb (28,800kg) |
| Maximum | 130,000lb (58,967kg) | 121,000lb (54,884kg) | 121,000lb (54,884kg) |
| Performance | | | |
| Cruise speed | | | |
| at 10,000ft (3,000m) | 308 m.p.h. (496km/h) | 245 m.p.h. (394km/h) | 300 m.p.h. (483km/h) |
| Time to climb | | | |
| to 10,000ft (3,000m) | 7min | 10min 7sec | 8min |
| Service ceiling | 32,900ft (10,000m) | 30,000ft (9,100m) | 32,500ft (9,900m) |
| Range | | | |
| at 10,000ft | 4,500 miles (7,240km) | 4,500 miles (7,240km) | 4,500 miles (7,240km) |

Powerplants

FC.1 4 x 1,000 h.p. Bristol Taurus 14-cylinder two-row radial sleeve-valve piston engines

FC.2 4 x 1,610 h.p. Rolls-Royce Merlin T.24 liquid-cooled V12 piston engines

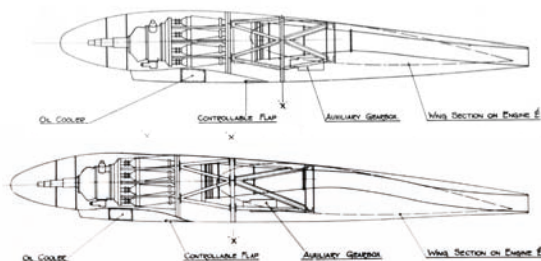
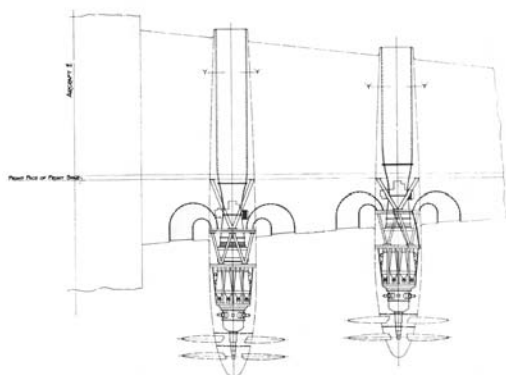
FC.3 2 x 1,310 e.h.p. Armstrong Siddeley Double Mamba turboprop engines driving contra-rotating props

FC.4 4 x 4,023 e.h.p. Bristol Proteus turboprop engines driving contra-rotating props

FC.5 4 x 3,135 e.h.p. Napier Nomad 12-cylinder two-stroke valveless diesel engine compounded with three-stage turbine driving crankshaft and axial compressor

FC.6 4 x 4,023 e.h.p. Bristol Proteus turboprop engines driving contra-rotating props

Official Fairey illustrations showing the nacelle layout for the Fairey Queen, including a plan view of the port wing (LEFT) and profile views of the outer nacelle (BELOW) and inner nacelle (BOTTOM).





ABOVE LEFT A somewhat utopian vision of the future of air travel, this sequence of illustrations from a contemporary brochure for the *Fairey Queen* shows the various compartments for the passengers, including the lower-deck dining area, as seen here.

ABOVE A stewardess appears surplus to requirements in the main upper-deck passenger cabin; presumably the prospective customer hoped for rather better business than shown in the promotional material.




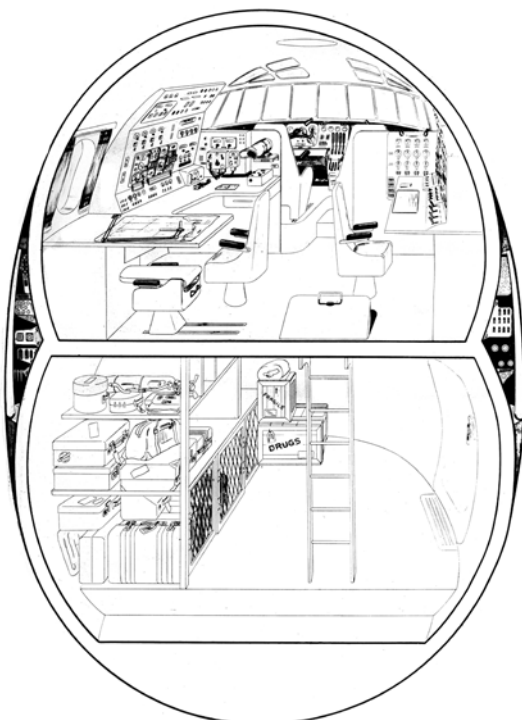
LEFT Having polished off a fine meal on china plates with silver cutlery, the *Fairey Queen* passenger could retire to the lounge-cum-library, complete with well-stocked bar, bookcase and comfortable seats. Had it been built, the reality for the *Fairey Queen* would more likely have been a high-density coach-class layout.

external service-duct running along each side of the fuselage, in which all controls, cables, air conditioning and other equipment could be installed and serviced from outside the fuselage, leaving its interior free for essential internal services. Quickly detachable panels made access easy.

OUT OF TIME

There were no bidders for any of these highly efficient — on paper, at least — airliners and once again Fairey's attempt to break into the airline market failed. The Brabazon Committee had pointed out that new types developed to fulfil its five basic types would quite quickly become obsolete in view of the innovations in aircraft and engine design then being introduced on a regular basis. This was an important part of why the *Fairey Queen* lost its impact. By the time Fairey had developed its airliner to the point at which it could enter airline service, it would have been virtually obsolete and overtaken by the advent of the jet engine. Development of the FC.1 had been stopped on the outbreak of the war and the type was considered too small to continue afterwards.

By 1947 the FC.2 and FC.3 were outside the remit of the Brabazon Committee's specifications, as was the advanced *Fairey Queen*. All was not lost, however, as the company went on to develop a number of important military and experimental aircraft, including the Gannet anti-submarine aircraft and record-setting FD.2 supersonic delta, until its merger with Westland in 1960. 



ABOVE A contemporary *Fairey* illustration of a cross-section of the forward part of the *Fairey Queen*'s double-bubble fuselage, with the capacious freight hold beneath the flightdeck. Note also the equipment ducts running in the voids between the curved upper and lower fuselage sections, making servicing easier.

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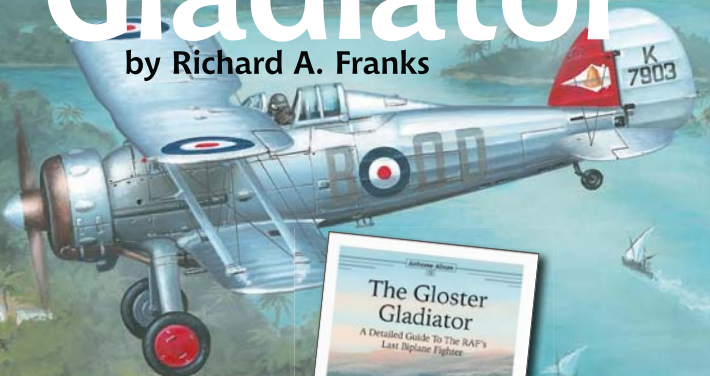
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INDONESIA'S FLEDGLING INSECTS

Today, Indonesia is renowned as a world-class manufacturer of military and civil aircraft designed elsewhere; much less well-known is the work of the nation's own thriving — if modest — aircraft design bureau, established in the wake of its independence in 1949–50. **NICK STROUD** explores the career of the homegrown pioneer who forged it, and the series of types it built over the next two decades

MOSTLY KNOWN today in aviation terms as a builder of foreign designs under licence, Indonesia has traditionally punched well below its weight when it comes to aeronautical development, particularly in light of its status as the world's largest island nation and the fourth most populous country on the planet. However, there was a period in the 1950s when Indonesian resourcefulness and ingenuity was mobilised to produce of a handful of homegrown military and civil aircraft, largely thanks to the determination and passion of one man — pilot and aircraft designer Nurtanio Pringgoadisuryo.

Born on December 3, 1923, in Kandangan, South Kalimantan, on the island of Borneo (then part of the Netherlands East Indies — NEI), Nurtanio developed an early interest in aviation, becoming an avid subscriber to Dutch bi-weekly magazine *Vliegwereld*. Indeed, such was the young Nurtanio's enthusiasm that he regularly corresponded with the magazine, requesting details and more information to help with his all-consuming hobby of aeromodelling. The latter activity put him in touch with other local enthusiasts, including Wiweko Soepono and R.J. Salatun, both of whom, with Nurtanio, would go on to play significant roles in the establishment of Indonesia's post-war aircraft industry.

THE YOUNG PIONEER

When the Japanese invaded Borneo and the rest of the NEI in 1941, Nurtanio was at technical college, where he had already established the Junior Aero Club for like-minded individuals to get together and build basic flyable model aircraft. He also began reading every book he could get his hands on about aeronautical engineering, most of which were in German (English being banned by the Japanese), which no doubt influenced his decision to begin work on designing and building his own full-scale version of Alexander Lippisch's 1926-vintage Zögling high-wing cable-braced single-seat glider, although it is unclear if it was ever completed and flown.

In 1945 Nurtanio joined the newly-minted aviation division of the People's Security Force, which formed the nucleus of what would become the *Angkatan Udara Republik Indonesia* (AURI — Indonesian Air Force), at Yogyakarta on Java, working in the

Planning & Information Department, where he was reunited with Wiweko. Despite the turmoil of the ongoing Indonesian War of Independence, in which numerous factions vied with each other to fill the power vacuum left in the wake of Japan's surrender in August 1945, Nurtanio and Wiweko set to work to build six Zögling-based glider designs of their own, given the designation NWG (Nurtanio Wiweko Glider).

The glider was built at Maospati in eastern Java, and is the only Indonesian aircraft ever to have been constructed entirely from local materials, mainly jamuju conifer wood for the fuselage structure, locally-spun fabric for the wings and, intriguingly, "cow's-lips porridge" (*cingur*) to hold parts of it together. The NWGs were then to be used to give cadet pilots *ab initio* flying training, after which they would be sent to India for further training. Nurtanio later pointed out that of the cadets who had received initial instruction on the NWGs and went on to undergo powered-flight training, none was "washed out", all ultimately becoming officers in the nascent AURI.

As an aside, in 1947 Wiweko designed and built a light aircraft of parasol-wing configuration, the WEL-1 (for Wiweko Experimental, Light), powered by a 28 h.p. Harley-Davidson motorcycle engine — which, despite an acute shortage of materials, moved from drawing-board to first flight in a mere five months. It was reportedly destroyed after a short flying career.

In 1948 Nurtanio was posted to Manila in the Philippines to continue his studies with the first international Filipino airline, Far Eastern Air Transport Inc. By 1950 the 26-year-old had returned to Indonesia, where the AURI had taken over the workshops of the hitherto Java-based Royal Netherlands East Indies Air Force (RNEIAF), which was disbanded when

Indonesia gained full independence during 1949–50. Accordingly, a design bureau was established at Bandung on Java as part of the AURI, designated the AURI Depot *Penyelidikan, Pertjobaan dan Pembuatan*

OPPOSITE PAGE, TOP Major Nurtanio Pringgoadisuryo stands beside the NU-200 Sikumbang on its roll-out at Bandung in the summer of 1954.

For this article we have used the Indonesian custom of putting the surname first. **LEFT** A rare photograph of Nurtanio in his AURI uniform. Nurtanio was the driving force behind the establishment of Indonesia's nascent aircraft industry.





ABOVE The sole NU-200 *Sikumbang* aloft after its first flight in August 1954. Bearing a large “X” on the tail to denote its experimental status, the “Bee” also carried the nation’s red-and-white pentagon marking and the serial “01”. The bare-metal fuselage was wrapped with a yellow band and the upper surfaces and fin were orange-red.

(Indonesian Air Force Research, Development and Production Depot), to which Nurtanio, by now a Major, was posted.

As part of its withdrawal, The Netherlands sent a military mission to Indonesia to supervise the modernisation of the AURI, which up until that point had been struggling to operate a dilapidated fleet of ex-Japanese military aircraft rescued from a dump near Yogyakarta in 1945, including Tachikawa Ki-9s and Ki-55s, Nakajima Ki-43 Hayabusas, Kawasaki Ki-48s, Mitsubishi Ki-46 and Ki-51s and one or two Kawanishi H6K flying-boats. Thus the AURI was delighted when substantial amounts of former RNEIAF equipment was transferred to its inventory, including North American F-51 Mustangs, T-6 Texans and B-25 Mitchells, a Noorduyt Norseman, some Piper Cubs, Douglas C-47 transports and a few Consolidated PBV-5A amphibians, on June 21, 1950.

THE BEE

With many of the new nation’s more remote islands yet to be brought fully to heel after five years of often violent political turmoil, it was decided to design and build an indigenous light single-seat ground-support aircraft that could be used to quell unrest among the country’s 17,000 islands. Accordingly, Nurtanio set about designing the NU-200, named *Sikumbang* (Bee), at Bandung. Powered by a single 200 h.p. de Havilland Gipsy Six inverted air-cooled piston engine driving a two-bladed fixed-pitch propeller, the first and only *Sikumbang* prototype, serial “X-01”, made its maiden flight from Husein Sastranagara Air Force Base at Bandung on August 1, 1954.

The *Sikumbang*’s cantilevered low wing employed a NACA 23012 aerofoil of one-piece two-spar all-wood construction with plywood covering, fitted with electrically operated split-type flaps and statically balanced ailerons. The tail surfaces were also plywood-skinned wooden structures with a trim-tab fitted to the rudder and the port elevator. The fuselage was fabricated in welded 4130 steel (chromoly) with metal skins, and the undercarriage was of fixed tricycle type with cantilever oleo shock struts and a non-steerable nosewheel.

To celebrate the design, construction and maiden flight of Indonesia’s first all-metal aircraft, Nurtanio made plans to fly the prototype over the 9,600ft (2,900m) summit of Mount Merapi, near Yogyakarta. However, Nurtanio’s longtime friend Salatun reportedly had a “bad feeling” about the flight and begged his friend not to proceed with the idea, Salatun explaining that Nurtanio was too valuable for Indonesia’s fledgling aircraft industry to lose. The Chief of the Air Staff, Air Vice-Marshal Suryadi Suryadarma, agreed and ordered the cancellation of the flight. Disappointed, Nurtanio flew the *Sikumbang* over Bandung instead, the engine spluttering to a halt as he came into land at Husein Sastranagara. Had he made the flight to Mount Merapi, an emergency landing in the mountainous terrain would have been impossible; Salatun’s “bad feeling” had probably saved his friend’s life.

Promoted Lieutenant-Colonel, Nurtanio felt the *Sikumbang* could be improved, and, after extensive testing of the type, he turned his hand to an improved version, the NU-225. With the Gipsy engine and wooden propeller replaced



ABOVE The cockpit of the NU-200 was relatively simple, but included all the necessary basics, including altimeter, r.p.m. gauge, airspeed indicator, turn-and-bank indicators, compasses, fuel gauge, climb meter and manifold-pressure gauge. The throttle box was located on the port side, above the trim-control equipment, seen at LEFT.

by a 225 h.p. Continental O-470-A six-cylinder horizontally-opposed air-cooled engine driving a Hartzell metal constant-speed propeller, the NU-225 prototype, serial "X-02", made its first flight on September 25, 1957. The improved Bee was of a similar size and configuration to the NU-200, but was reportedly fitted with a retractable tricycle undercarriage, although this seems unlikely. The wing was again of wooden construction but employed a NACA 23015 aerofoil at the root, which slimmed to a NACA 23009 aerofoil at the tip. The flaps were split-type again, but were mechanically, rather than electrically, operated.

The AURI close-support programme did not proceed any further than the two Sikumbang prototypes, and although work was reportedly begun in 1960 on a four-seat liaison version of the NU-225 (a civilian version designated the Model 260 *Kumbang* — Beetle — was reported as 80 per cent complete in *Jane's All*

The World's Aircraft 1969–70), all work on the type was ultimately abandoned. The prototype Sikumbang was retired in 1967 and placed on a pedestal in front of the workshops at Bandung. It remains in excellent condition in the former AURI workshop sheds at Bandung today.

THE GRASSHOPPER

In 1957, for reasons that remain unclear, the AURI decided to take a look at its fleet of Piper L-4J Cubs to explore whether the type could be reworked into a more suitable trainer, essentially by taking an example apart and putting it back together in a different order. The result was the low-winged NU-85 *Belalang* (Grasshopper), powered by the Piper's 85 h.p. Continental C-85 four-cylinder horizontally-opposed piston engine driving a Sensenich two-bladed fixed-pitch propeller, and which made its maiden flight on April 17, 1958. After extensive testing, the AURI decided that the low-wing *Belalang*

The Sikumbang awaits another flight from Husein Sastranagara Air Force Base at Bandung, with an AURI Consolidated PBV in the background. The pilot sat just above the leading edge under a sliding cockpit canopy which provided an excellent view in all directions.





ABOVE An air-to-air study of the NU-200, showing the aircraft's straight-tapered wing, which was of single-piece wooden construction with an aspect ratio of 6.5:1. Contemporary press reports highlighted the NU-200's similarity in intended role to the USA's Fletcher FD-25 Defender COIN aircraft, which was not adopted by American forces.



ABOVE The upside-down Cub — with its name and a grasshopper motif on the forward fuselage, a production NU-90 Belalang meanders over the Indonesian countryside. Quite why the Indonesians considered the low-wing Belalang an improvement over the high-wing Cub from which it was derived remains something of a mystery!



ABOVE Designed as an economical single-seat ultra-light training aircraft for pilots of very limited experience, the NU-25 Kunang first flew circa 1957–58, and was roughly equivalent to the Druine Turbulent in terms of size and performance. The same aircraft, “04”, was later fitted with a 35 h.p. engine and an enclosed cockpit with canopy.

was a better primary trainer than the standard L-4J, and in 1960 the workshops at Bandung began converting all of the air arm’s L-4Js into NU-90s, fitted with a 90 h.p. Continental C-90-12F flat-four direct-drive engine.

The USA-35B aerofoil of the L-4J’s wing was retained but the flaps were later removed and the aileron length extended on the NU-90A, which was fitted with a Continental O-200 (an uprated C-90) engine with a 6ft (1.8m)-diameter McCauley metal fixed-pitch propeller. The Belalang’s wing was braced by vee struts from the top fuselage longerons and was set with 1° 37’ incidence at the root and 5° dihedral. The wings incorporated its forerunner’s standard spruce spars, aluminium ribs and fabric covering, but the aluminium-alloy-frame control surfaces were fibreglass-covered.

The welded-steel fixed surfaces on the tail were fabric-covered but the rudder and elevators were again fibreglass-covered. The fuselage was fibreglass-covered welded steel, while the cockpit canopy was in two sections; the forward unit hinged to open to starboard and the rear section sliding aft. The L-4J’s split-axle mainwheels were retained but were moved forward some 4in (10cm). The Kelsey-Hayes wheels were fitted with Goodrich low-pressure tyres and incorporated hydraulic expander-tube brakes. The Belalang entered very small-scale

production in the early 1960s, and at least five NU-90 Belangs saw service with the AURI and Indonesian Army.

FIREFLIES AND A DRAGONFLY

Having got the bit between its teeth, Indonesia’s growing aircraft industry set its sights on the civil light aircraft market, and during 1957 work was started on an economical lightweight single-seat low-wing aircraft for Indonesian flying clubs. Of fabric-covered wood construction, the NU-25 Kunang (Firefly) was powered by a 25 h.p. Volkswagen flat-four air-cooled engine driving a two-bladed fixed-pitch propeller of 4ft 9in (1.45m)-diameter, although a more powerful 35 h.p. VW engine was later fitted.

The Kunang’s wing was tapered, with a mean chord of 2ft 11in (0.9m), incorporating a NACA 2412 aerofoil and an aspect ratio of 7:1. The spars were of box type with girder-type ribs and the wing was fitted with fixed leading-edge slats. An exact first-flight date remains elusive, but after testing of the prototype the span was increased from 22ft 11in (6.98m) to 28ft 2½in (8.6m), giving a revised aspect ratio of 9.6:1. The extended-span wing had a dihedral of 5°, with 3° incidence at the root and 0° at the tip. The open-cockpit fuselage was constructed of a spruce and plywood framework with a fabric covering, and the tail unit was of braced-wire monoplane type



with a swept fin and tapered tailplane.

The undercarriage was of standard tail-dragger type, the mainwheels incorporating Auster Mk III shock absorbers, low-pressure tyres and hydraulic expander-tube brakes. The leaf-spring tailwheel was steerable. An enclosed cockpit with a simple canopy was also later fitted to the prototype. Ultimately, only one, serial "X-04", was built, and made its first flight in 1958. A replica of the yellow-painted aircraft is currently on display at the Satria Mandala Museum in Jakarta.

A modified version of the Firefly, possibly using the sole NU-25 airframe as the basis, was developed and went into small-scale production as the NU-35 Super Kunang. Powered by a 35 h.p. VW flat-four engine, the NU-35 replaced its predecessor's swept surfaces with unswept surfaces to improve directional control at low speeds. Construction was similar to that of the NU-25, but incorporated a constant-chord wing with a NACA 23012 aerofoil. The tail was also "squared" and the fin and rudder height increased. According to *Jane's All The World's Aircraft (JAWA)* 1965–66, an NU-40 Super Kunang was also developed with a second seat "for a child", aft of the pilot's cockpit and a 40 h.p. VW engine. A side-by-side two-seat trainer version, the NU-65, was also proposed, although whether a prototype, to be powered by a 65 h.p. Continental flat-four engine, was ever completed and flown is unclear.

By the end of 1964 work was also progressing on a three-place agricultural biplane designated the Model 150 *Kindjeng* (Dragonfly). The single-bay wings employed a USA-35B aerofoil and

ABOVE *The tapered wings and swept fin of the NU-25 Kunang were replaced in stages on the NU-35 Super Kunang, probably built using the same airframe, initially with a constant-chord wing of 25 per cent greater area and later an unswept fin, as seen here. An uprated 35 h.p. Volkswagen engine was also fitted.*

power was provided by a 150 h.p. Lycoming O-320-A2C flat-four engine driving a two-bladed fixed-pitch metal propeller. The fuselage was of steel-tube construction with a fabric covering, and the enclosed cockpit was configured to have the pilot's seat in the centre at the front with an easily-removable bench-type seat in the rear for two passengers. The rear seat could be replaced by a hopper for agricultural chemicals if required.

The aircraft was a taildragger with an unretractable undercarriage attached by means of two side vees and half-axles hinged to the centreline of the underside of the fuselage. How many were built remains something of a mystery, as does any information regarding its maiden flight, but the type was no longer listed in *JAWA* by the mid-1970s, so it may be assumed that comparatively few were built.

A venture into the rotary-wing world was also proposed with the development of the *Manjang* single-seat light helicopter, powered by a single 100 h.p. vertically-mounted Continental flat-four engine with reduction gear driving a two-bladed see-saw-type rotor with cyclic pitch control. The prototype is listed in *JAWA* 1969–70 as "95 per cent" complete, but little more seems to be known about the type.

In August 1961 the Research, Development & Production Depot was reorganised to become

INDONESIA'S HOMEGROWN AIRCRAFT DATA



| | NU-200 Sikumbang | NU-90A Belalang | NU-25 Kunang (prototype) | NU-35 Super Kunang |
|---|------------------------|----------------------|-----------------------------|-----------------------|
| Dimensions | | | | |
| Span | 34ft 10in (10.6m) | 31ft 1in (9.5m) | 22ft 11in (6.98m) | 25ft 0in (7.6m) |
| Length | 26ft 9in (8.2m) | 25ft 3½in (7.7m) | — | 20ft 0in (6.08m) |
| Height | 11ft 0in (3.35m) | 6ft 8in (2.03m) | 5ft 10in (1.77m) | 5ft 10in (1.78m) |
| Wing area | 182ft² (16.9m²) | 161.5ft² (15m²) | 72.9ft² (6.7m²) | 107.5ft² (10m²) |
| Weights | | | | |
| Empty | 1,753lb (795kg) | 1,038lb (472kg) | 352lb (160kg) | 506lb (230kg) |
| Loaded | 2,403lb (1,090kg) | 1,500lb (682kg) | 572lb (260kg) | 726lb (330kg) |
| Performance | | | | |
| Max speed | 159 m.p.h. (256km/h) | 115 m.p.h. (184km/h) | — | — |
| Cruise speed | 139 m.p.h. (224km/h) | 90 m.p.h. (144km/h) | 85 m.p.h. (137km/h) | 80 m.p.h. (130km/h) |
| Landing speed | — | 45 m.p.h. (72km/h) | 50 m.p.h. (80km/h) | 45 m.p.h. (72km/h) |
| Climb | 1,000ft/min (305m/min) | 600ft/min (183m/min) | — | 460ft/min (140m/min) |
| Service ceiling | 16,500ft (5,030m) | 12,000ft (3,660m) | — | — |
| Normal range | 600 miles (965km) | 350 miles (560km) | — | — |
| Powerplant | | | | |
| NU-200 Sikumbang 1 x 200 h.p. de Havilland Gipsy Six six-cylinder air-cooled inverted inline piston engine | | | | |
| NU-90A Belalang 1 x 100 h.p. Continental O-200 four-cylinder horizontally-opposed air-cooled piston engine | | | | |
| NU-25 Kunang (prototype) 1 x 25 h.p. Volkswagen flat-four air-cooled piston engine | | | | |
| NU-35 Super Kunang 1 x 35 h.p. Volkswagen flat-four air-cooled piston engine | | | | |

the *Lembaga Persiapan Industri Penerbangan* (LPIP — Institute for the Development of the Aircraft Industry), and by the end of that year was actively negotiating for contracts to manufacture aircraft under licence. One result was a production contract with Poland for the manufacture of the appropriately insect-like PZL-104 Wilga, or *Gelatik* (Rice Bird) as the Continental flat-four-engined Indonesian versions were designated. Production began in 1963 and the first Gelatik made its maiden flight in 1964, the original contract being for some 56 examples, although most sources state that a total of 44 was actually built during 1963–74.

DEATH OF A PIONEER

By 1966 Nurtanio, by all accounts a humble, polite and hardworking individual, had been promoted Air Marshal and was pursuing a path of gradual but steady development for Indonesia's nascent aircraft industry. It came as a shocking blow then, when Nurtanio was killed in the crash of an Aero 45 twin-engined touring aircraft in which he was preparing to make a round-the-world flight, on a practice flight on March 21, 1966. The aircraft suffered engine failure, forcing Nurtanio to attempt a forced landing in a field near Bandung. Sadly, the aircraft, fitted with extra fuel tanks for extended range, struck a storehouse and exploded, killing Nurtanio instantly.

The industry was traumatised and in his honour, LPIP was renamed *Lembaga Industri Penerbangan Nurtanio* (LIPNUR — Nurtanio Aircraft Industries) that year. In 1973 another production contract was signed with

American constructor Pazmany for LIPNUR to manufacture the PL-2 three-place single-engined basic trainer/touring monoplane, the first Indonesian example of which, designated LT-200, first flew in November 1974.

The following year the government-owned Indonesian petroleum company Pertamina secured a contract with Spain and West Germany for licence production of the CASA C.212 Aviocar and Messerschmitt-Bölkow-Blohm Bo 105 helicopter respectively, and in 1976 LIPNUR and Pertamina merged to become *Industri Pesawat Terbang Nurtanio* (IPTN).

The Indonesian aircraft industry continued to thrive, even if only by manufacturing the designs of other nations under licence, including the CASA CN-235 twin-engined transport aircraft and a number of Aérospatiale Puma/Super Puma helicopter variants among other types, but the appetite to develop homegrown aircraft designs apparently died with Nurtanio in the mid-1960s. Indeed, when the industry was reorganised again in 1985, the name Nurtanio was excluded altogether to become *Industri Pesawat Terbang Nusantara*, the latter word being an ancient Javanese name for the Indonesian archipelago. Shockingly, there were unsavoury — and highly questionable — allegations that IPTN letterheaded paper had been used by Nurtanio's surviving family to appropriate IPTN stocks, none of which was ever substantiated and which rings of an unpleasant and unnecessary "smear campaign" to remove his influence from the industry — an ignominious legacy for Indonesia's single most distinguished aviation pioneer.





ARMCHAIR AVIATION

We take a look at what's available for the aviation history enthusiast in the world of books and other literature, from hot-off-the-press publications to reissued classics

Phoenix — A Complete History of the Luftwaffe 1918–1945, Volume 1: The Phoenix is Reborn 1918–1934

By Richard Meredith; Helion & Company, available from Casemate (www.casematepublishing.co.uk); 7in x 9½in (175mm x 241mm); hardback; 650 pages; illustrated; £49.95. ISBN 978-1-910294-50-5

THE BULK OF the historiography on Nazi Germany's Luftwaffe is weighted, perhaps unsurprisingly, in favour of the Second World War years. Studies abound, to ever-increasing levels of detail and specialism, on the Luftwaffe's aircraft, units, pilots, campaigns, camouflage, markings, weaponry, radar and even undercarriages. Invariably, these books are set against the dramatic backdrops of the heady years of *Blitzkrieg*, the colossal slugging matches of the Eastern Front or the desperate aerial defence of the Reich when some of the most impressive technology, albeit in limited quantity, was pitted against the Allied air forces. The desire for such information seems limitless.

By comparison, literature on how this initially mighty, but ultimately doomed, force came into being in the aftermath of the "war to end all wars" and Imperial Germany's defeat, constrained by the shackles of Versailles, is much scarcer. This is perhaps attributable to the sheer magnitude of the task facing a writer. The period from 1919 to 1935, with its conflicting and extreme internal national politics, the complexities of Weimar, the "hidden" *Reichswehr*, the difficult path of rebuilding industry and the economy, the rise of Hitler and subsequent rearmament, all influenced and affected inter-war German aviation. But it is these very factors that make the swift and generally overlooked pre-war formation of the Luftwaffe such a remarkable story.

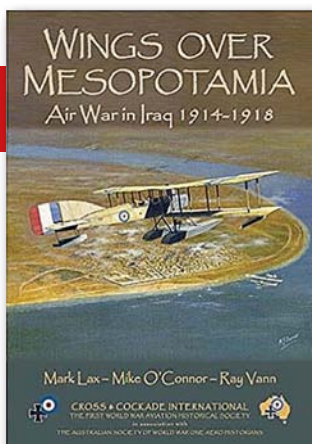
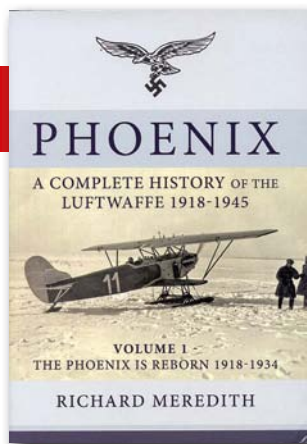
Richard Meredith has been brave enough to tackle the subject, and not with a broad brush. Here is a work of magnitude and scope which

demonstrates the author's rigorous steps to synthesise the historiography, as well as his understanding of the changing infrastructure, external dynamics, technology and personalities which shaped the force. This first volume examines the early covert measures taken by von Seeckt and Wilberg to re-establish an air arm, of a kind, in the years after the First World War; the forging of relations with Russia (which were never comfortable), both fiscal and in terms of facilities for training; the military and naval production programmes of the 1920s and the building of a Flak arm. He also covers the development of aviation from 1933 onwards, and its control and expansion by the Nazis, especially through the dogmatic drive of Goering and the energy of Milch, despite conflict between these two individuals and the prevailing economic depression. There is welcome detail on how the *Reichsluftfahrtministerium* was built up, and the personalities and functions of its administrative, personnel and technical departments, all of which played crucial roles in building what became, from 1935, the Luftwaffe.

Readers should be aware that to write this book, the author has drawn on a vast range of secondary sources and this is made very transparent in the copious footnotes. When a primary source is mentioned, mostly it is attributed to the secondary source in which it is contained. However, what can not be doubted is the author's encyclopædic knowledge of those secondary sources and their relevance.

The narrative text is supplemented by many charts and tables detailing ministerial and command structures, aircraft types and production programmes. There are also just short of 100 fascinating and varied photographs with very detailed captions as well as a useful bibliography. The book is well produced and presented with a handsome dustjacket.

To attempt what is billed as a "complete history" of the Luftwaffe is ambitious. So far, two further volumes of *Phoenix* are in preparation,



covering the period 1935–39. If they replicate this first volume, then this project will begin to form what will certainly be the largest and most detailed general study of the Luftwaffe in the English language.

The value of this first volume is in providing the reader with a diligent and empathetic “one-stop shop” overview of the period covered, based on the prime existing literature.

ROBERT FORSYTH

Wings Over Mesopotamia: Air War in Iraq 1914–1918

By Mark Lax, Mike O'Connor and Ray Vann; Cross & Cockade International, available via www.crossandcockade.com; 8½in x 11½in (210mm x 297mm); softback; 144 pages, illustrated; £25 + £2.30 p&p in the UK. ISBN 978-0-955573-48-4

AS WELL AS producing an excellent quarterly journal, Cross & Cockade International has established a reputation for publishing authoritative books on First World War aviation. This latest offering maintains the high standard, spotlighting a previously poorly covered theatre of operations. It is based upon a four-part history of the air war in Mesopotamia by Mark Lax, originally published in the '14-'18 *Journal* of the Australian Society of World War 1 Aero Historians; but it has been considerably enhanced and embellished as a result of the research undertaken by Ray Vann and the late Mike O'Connor of the UK, who tracked down logbooks, diaries and photo albums and consulted Service records.

The resulting book is far greater than the sum of its parts. Profusely illustrated with useful maps and clear photographs of aircraft, locations and personnel, its main section provides a blow-by-blow chronological account of events. There follow sections devoted to personnel, to “The

Importance of Water Transport”, and to a listing of Royal Flying Corps and Royal Naval Air Service aircraft serial numbers with individual service histories. A useful bibliography rounds off the book.

The bounteous collection of informatively captioned photos, many previously unpublished and including some unusual in-the-field aircraft modifications, is spread liberally throughout the book. All in all this is very good value, both for the material contained and for the high standard of production.

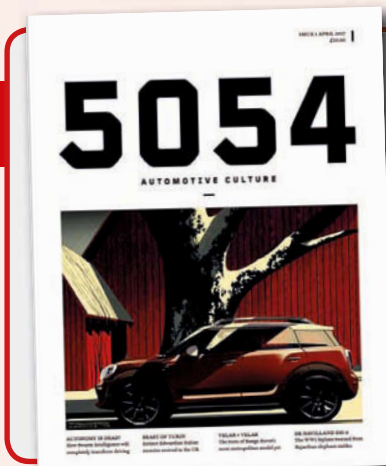
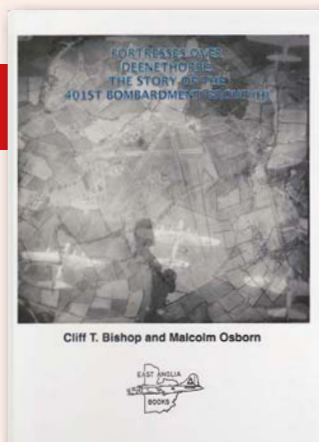
PHILIP JARRETT

Death Was Their Co-Pilot

By Michael Dörflinger; Pen & Sword Books, 47 Church Street, Barnsley, S70 2AS; 6½in x 9½in (160mm x 242mm); hardback; 208 pages, illustrated; £25. ISBN 978-1-473859-28-9

I MUST ADMIT I had immediate misgivings about this book because of the title, presumably inspired by Robert Lee Scott Jr's autobiography *God Is My Co-Pilot*. This volume is about fighter aces of the First World War — when no fighter aircraft had copilots. Even heavy bombers had only one set of controls. The original German title roughly translates as “Death Rides With Me”, which is better, but potentially poses a problem for the publisher; without a descriptive subtitle, how will people looking for a book on this subject find it online or in a bookshop?

Niggles about the title notwithstanding, this book does its job well enough, providing brief biographies of the principal aces of the war plus a basic overview of the development of air fighting, the principal types of aeroplane used and the air services of the countries involved. Anybody who has studied the subject in depth is likely to find little new here, but a reader fairly new to the subject will get a largely accurate



overview. However, there are a few errors and oversimplifications. For example, Karl Allmenröder was probably shot down by groundfire, not by Raymond Collishaw, and, less forgivably, the aircraft in the photograph on page 184 is captioned as a Sopwith Camel but is a Royal Aircraft Factory S.E.5. If there are errors that even a non-specialist reader can recognise, how can they be sure that there are none within information that is new to them?

The biographies of the aces are interspersed within the narrative history of the air war, which is fine, but a book using such a format needs an index. There is none here, which is a serious flaw, making the book difficult to use if looking up a particular airman.

The book was originally written and published in German, and it is probably no bad thing for readers more used to an Anglocentric view of history to be exposed to another point of view — but here the bias merely becomes the reverse. The section on Manfred von Richthofen is predictably long, whereas that on McCudden is disappointingly short, despite the latter frequently being described as the former's British equivalent. The author gives a reasonably balanced view of Albert Ball's death, but concludes that he was probably shot down, and that Max Immelmann was killed accidentally; books from the British perspective generally draw the opposite conclusions.

There are occasional glitches with the editing and translation. There are some interesting first-hand accounts, but the authors are not always identified. The UK publisher, and/or its editorial staff, appear to express opinions of their own, which they have no place doing. The author's view of von Richthofen is fairly balanced, but the photograph caption suggests that he may have been a "proto-Nazi", which is speculative at best. Even the dustjacket flap describes him as "infamous". Why? Was he a more ruthless killer than the British or French

aces? Sensitive fighter pilots don't last long. This is an interesting and useful book — but unfortunately a flawed one.

ADRIAN ROBERTS

Charles Pratt of Belmont Common: A Life in The Air — Geelong's Pioneer Aviator, Aerial Photographer and Flying Instructor

By Kevin O'Reilly; self-published, 12 Kimber Court, Dingley Village, Victoria 3172, Australia (available via e-mail jillor6@bigpond.com); 8½in x 12in (216mm x 305mm); hardback; 288 pages, illustrated; AU\$35, AU\$60 with postage. ISBN 978-0-646962-02-3

I SUSPECT THAT few *TAH* readers will even have heard of New Zealander Charles Daniel Pratt, but, as the subtitle of this book says, he was a pioneer aviator in Geelong, Australia, and also an aerial photographer and flying instructor. It must be said that this is a specialised subject, but the content is fascinating. The author has assembled an impressive collection of documents, photographs and diary extracts which provide a very comprehensive coverage of Pratt's long career in aviation.

Pratt was an Australian & New Zealand Army Corps (ANZAC) officer in the Royal Flying Corps in Egypt during the First World War. After the war's end, while he was sailing home to New Zealand with two Airco D.H.6s, an Avro 504 and a Sopwith Pup with the intention of establishing a flying school at Wellington, a strike by shipping engineers stranded him in Melbourne. Short of money, he unloaded one D.H.6 on the wharf and used it to give joyrides to boost his finances. He then settled in Geelong, where he was joined by his three brothers.

Pratt never looked back. Newspaper reports and his own diary and logbook entries trace his subsequent flying career in detail, and a gamut of fine, well reproduced photographs,

5054 MAGAZINE

Published and edited by Hilton Holloway; 8¼in x 11¼in (222mm x 286mm); 126 pages, illustrated; £10. Available only via the website, www.5054magazine.co.uk

THIS ATTRACTIVE NEW periodical was launched in 2017 on the cresting wave of so-called “boutique” print publishing, in which the traditional mainstream model, with its lumbering market inflexibility and appalling wastage, is replaced with a far more dynamic direct-to-customer paradigm. The brainchild of former *Autocar* Associate Editor and *Car* journalist Hilton Holloway, *5054* is not an aviation magazine *per se*, but its “automotive culture” tagline very much includes aeronautical design and engineering, as evidenced by the sumptuous ten-page feature on Guy Black’s superbly restored Airco D.H.9 in the first issue. Hilton explains: “*5054* is my attempt to completely rethink the idea of a ‘motoring’ magazine. What do I mean by ‘automotive culture’? Automotive means most things with an engine. And engines mean engineering. The ‘culture’ part of our mission is to investigate the wider world and wider impact of the automotive world”.

Beautifully designed by Art Director Patrick Myles and printed on high-quality paper with excellent colour reproduction, the first issue contains a thoughtfully-curated collection of immaculately appointed articles on subjects as diverse as Henry Ford, the Mini Countryman and the Aston Martin DB11. A second issue is being prepared for the end of 2017, with features on why the internal combustion won’t die and, controversially, why gas turbines could have a brighter future than batteries. So why *5054*? I’m sure *TAH* readers can work it out (think elliptically) . . . **NS**

mostly hitherto unseen, embellish the glossy pages of this large-format book. They include a great variety of inter-war Australian civil aircraft, including many British-designed types, and a good collection of his excellent aerial photographs. During 1942–47 Pratt flew as a captain with Australian National Airways, flying Douglas DC-2s, DC-3s and Stinsons, and he subsequently flew a de Havilland Puss Moth for pleasure and to undertake aerial photography work. He died in January 1968.

This volume is well worth its asking price; unfortunately the outrageous cost of postage may well deter English readers from investing in it, which would be a great shame. However, it deserves to do well, and Australian enthusiasts in particular would be wise to acquire it, as it will undoubtedly become a treasured and collectable item.

PHILIP JARRETT

Fortresses over Deenethorpe: The 401st Bombardment Group (H) 1943 to 1945

By Cliff T. Bishop and Malcolm Osborn; East Anglia Books, PO Box 12408, Stansted, Essex CM24 8UZ; 12in x 8½in (305mm x 215mm) hardback; 204 pages, illustrated; £40. ISBN 978-1-869987-18-3

BORN AND RAISED under the big skies of East Anglia, the late Cliff Bishop took every opportunity during his early years to cycle from airfield to wartime airfield, to watch the mighty B-17s and B-24s of the US Eighth Air Force. He went on to serve in the RAF and to become a highly respected Eighth Air Force historian — such are the influences of intense experience on a young mind — and he remained rooted in the region, establishing East Anglia Books (EAB) in 1982. Sadly, Cliff died in late 2014, but his daughter Marilyn continues to run EAB.

In 2008 Cliff began work on this history of

the 401st Bomb Group, but other publishing projects intervened and it was not until a few weeks before his death that he enlisted the help of Malcolm Osborn to help him complete it. Malcolm took up the baton, and the result is a fine memorial to the book’s instigator.

At the heart of the volume, and comprising about half of its content, is a comprehensive diary of the unit’s operations in the UK from November 1943 to June 1945. It is well-illustrated with black-and-white photographs and also draws upon maps, tables, charts, combat reports and colour reproductions of original route and procedure diagrams. The human angle is not forgotten, with illustrations of life in the messes and the PX.

Potted biographies of the unit’s commanders are also included, as is an introduction to the group’s formation and training before it left the USA for Europe. An eight-page list of individual aircraft histories of the group’s B-17s is followed by chronological charts showing the service lifespan of aircraft from each Bombardment Squadron (BS) in the group, some lasting mere days. Several pages of nose-art photographs are accompanied by a list of aircraft names (*Swingin’ on a Star*, *Grumblin’ Gremlin* etc) tied, in most cases, to serial numbers.

Towards the back of the volume, a section of Missing Air Crew Reports and casualties underlines the heavy toll exacted on the unit during its operational phase; a concluding colour-photography section includes some fine wartime pictures plus more modern images depicting the unit’s historical legacy.

An especially poignant element of the book occurs in an extract from a memoir written by an officer of the group’s 614th BS, where the nature of luck is discussed: “What we were trying to rationalise was not that some men lived and others died, but that, as it seemed, some men were sought out by death and others were passed over under particularly deadly circumstances”.

MICK OAKEY



BOOKS IN BRIEF

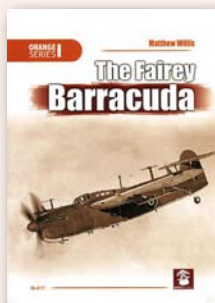
A quick round-up of what else is currently available for the aviation history enthusiast

THE FAIREY BARRACUDA

Matthew Willis

Mushroom Model Publications;
ISBN 978-8-365281-24-1; £19

REGULARLY SIDELINED as “misbegotten and best-forgotten”, Fairey’s replacement for the venerable Swordfish actually accounted for a surprising amount of shipping during the Second World War and equipped some 26 front-line squadrons over its decade-long career — as the ever-dependable UK naval aviation historian Matthew Willis points out in his introduction to this comprehensive history of the little-loved torpedo-bomber. Included is a full technical description, scale drawings by Dariusz Karnas and 25 colour artworks by J.P. Vieira. Misbegotten? Perhaps. Best forgotten? Definitely not. **NS**

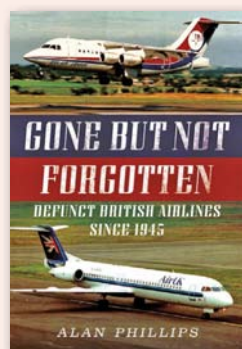


GONE BUT NOT FORGOTTEN — Defunct British Airlines Since 1945

Alan Phillips

Fonthill Media; ISBN
978-1-781556-27-6; £16.99

THIS 6¼in x 9¼in (171mm x 248mm) softback provides brief details of 70 British airlines which have come and gone since the end of the Second World War. What the criteria is for their inclusion is not specified, no fleet listings are provided and the majority of the photographs of indifferent quality are cropped uncomfortably close to the perfect-bound spine. A fond stroll down memory lane for some perhaps, but hardcore researchers may find Maurice J. Wickstead’s *Airlines of the British Isles Since 1919* (Air-Britain), available on CD at a similar price, more useful instead. **NS**



VOUGHT OS2U KINGFISHER

Kev Darling

Guideline Publications; no ISBN;
£14.50

NUMBER 111 in the long-running and reliable *Warpaint* series, this 48-page A4-format monograph is a useful reference source on an unglamorous but effective workhorse of the US Navy during World War Two. Operating on a wheeled undercarriage or as a triple-float seaplane, the Kingfisher had its moment of glory at Truk Island in April 1944, where its combat search-and-rescue capabilities were proven. Illustrated with colour and black-and-white photographs, excellent scale drawings and plentiful colour profile artwork by Richard J. Caruana, the softback also covers Kingfishers used by other air arms, and includes a list of kits, transfers and accessories available to modellers. **MO**

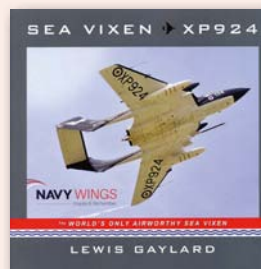


SEA VIXEN XP924

Lewis Gaylard

Clevelands (www.clevelandsdiecast.co.uk); no ISBN;
RRP £13.99 (softback)

THIS SECOND edition of aviation photographer Lewis Gaylard’s extensive collection of photographs, technical information and crew recollections about sole airworthy de Havilland Sea Vixen XP924 has been updated to include highlights of the 2016 season, before its unfortunate hydraulic failure and wheels-up landing at Yeovilton in May 2017. Containing numerous glorious colour photographs of the Vixen and some fascinating memories of operating the type, both in service and on the airshow circuit, this is an excellent reminder of just what an extraordinary machine it is, and why it’s important that it returns to the sky. **NS**



THE WRIGHT BROTHERS STORY

Mike Roussel

The History Press; ISBN
978-0-750970-47-1; £9.99

ALTHOUGH THIS little landscape-format book (7½in x 5in) is obviously aimed at younger readers, it will also serve as an excellent basic primer on the Wright Brothers for anyone making their first forays into aviation’s early history. Well written and amply illustrated with well-reproduced photographs with informative captions, it is an attractively designed and reasonably priced volume. All students of the Wrights ought to have it in their libraries. **PJ**



THE HISTORY OF WOODFORD AERODROME

Mark Williams

Ringway Publications; ISBN
978-0-9570826-9-4; £14.99

THE TITLE is a misnomer: this 96-page softback is really more a collection of potted histories of Avro and other aircraft types built at, or associated with, Woodford. That said, it does include a few pages of historical content about the airfield, plus personal recollections of an avionics engineer based there, and tangentially relevant memories by an RAF Shackleton pilot. *A The Road to Closure* chronology reminds us that the aerodrome is now a memory — except for the fine Avro Heritage Museum on the site. **MO**



Lost & Found

PHILIP JARRETT explores the lesser-known corners of aviation history, discovering unknown images and rediscovering long-lost details of aircraft, people and events. This time he needs your help to find out more about a wartime air-sea rescue unit and its crew

THESE RECENTLY acquired snapshots merely had "1941 Swansea" written on their backs, but a bit of quick digging soon yielded some more information. The best clue was the Boulton Paul Defiant in the background of the more distant group shot. It bears the code letters VA-P, which identifies it as belonging to No 125 Sqn, based at RAF Fairwood Common in South Wales, close to Swansea, from late September 1941 to January 1942, tasked with countering Luftwaffe night raids on South Wales and the Bristol area.

The Westland Lysander Mk IIAs were rather more interesting, even though no serial numbers are visible. The initials "ASRS" forward of their fuselage roundels denotes that they were in an air-sea rescue unit, and I presume the letters stood for Air Sea Rescue Service (or Squadron).

I have yet to find a picture showing these initials on others of their kind. This leads to the conclusion that they belonged either to an Army Co-operation Command detachment or to No 276 Sqn, a search-and-rescue unit created from the Command in October 1941 and which was based at Harrowbeer in Devon, and had a detachment based at Fairwood Common at this time.

Unfortunately the personnel, who appear to be the same in both pictures, are unidentified. In both cases the front row comprises the aircraftmen who presumably maintained the "Lizzies" and their engines. In the rear row in the group close-up there are, from left to right, three sergeant air gunners, a sergeant pilot, a pilot officer, another sergeant pilot and a flight sergeant air gunner. Can someone identify any of them, or are their names now lost to posterity?



RIGHT *The members of the search-and-rescue detachment at Fairwood Common, near Swansea, in the latter part of 1941. Are any faces familiar?*

BELOW *A pair of Westland Lysanders bearing the somewhat primitively-applied initials "ASRS" on their fuselages, with Boulton Paul Defiant VA-P of No 125 Sqn in the background.*

Note the special air-sea rescue canisters attached to the nearest Lysander's undercarriage fairing. If you have any more information on these Lysanders or the crew in the group portrait at right, let the Editor know!





PREMIUM PARKING

MELBOURNE & THE 1973 AIR TRAFFIC CONTROL STRIKE

In late 1973 a pay dispute involving Sydney's air traffic controllers brought airline operations in south-eastern Australia to a grinding halt. An alternative airport for international flights had to be found — and fast. Melbourne stepped into the breach, becoming a spotter's paradise in the process, as **PHIL VABRE** explains





Melbourne Airport, October 1973: parking was in such short supply at Tullamarine that the taxiways had to be pressed into service. In the foreground of this photograph taken at the time are three Boeing 707s parked nose to nose and tail to tail, comprising British Caledonian's G-BAWP — a rare visitor to Melbourne — Qantas's VH-EAF, named City of Townsville, and BOAC Cargo's G-AVPB.

AIRSERVICES AUSTRALIA/CASA/CAHS

IN JULY 1970 a completely new modern airport at Tullamarine, on the outskirts of Melbourne, Australia, opened for international operations. The following year domestic operations moved up the road from the old Melbourne Airport at Essendon. For all its modernity and space, the new Melbourne Airport was something of a “sleepy hollow” for the first few years of its life. That all changed in October 1973, when a strike by government communications technicians in Sydney over pay equality with other public service classifications shut down virtually all air traffic in south-eastern Australia. The strikers included the crucial radio and radar technicians of the Department of Civil Aviation (DCA).

Sydney (Kingsford Smith) Airport, Australia's main international air hub at that time, was closed indefinitely on October 3 following the failure of a key air-to-ground communications centre at Woronora, 17 miles (30km) south-west of Sydney. After the failure of two more essential navigation



RIGHT *This unique line-up on Melbourne's freight apron shows the three main types then in the Qantas fleet on the ramp together. From nearest to camera: Douglas DC-4, Boeing 707 and 747. Qantas retained a pair of DC-4s for services to Norfolk Island but was in the process of becoming an "all-747" airline. Beyond the Qantas line is a pair of Ansett Lockheed Electras.*

aids, Canberra Airport, between Melbourne and Sydney, was open to only two arrivals an hour, with the airport threatening to close altogether if bad weather struck. Air traffic on the east coast continued on a heavily restricted basis with air traffic control (ATC) using backup communication systems.

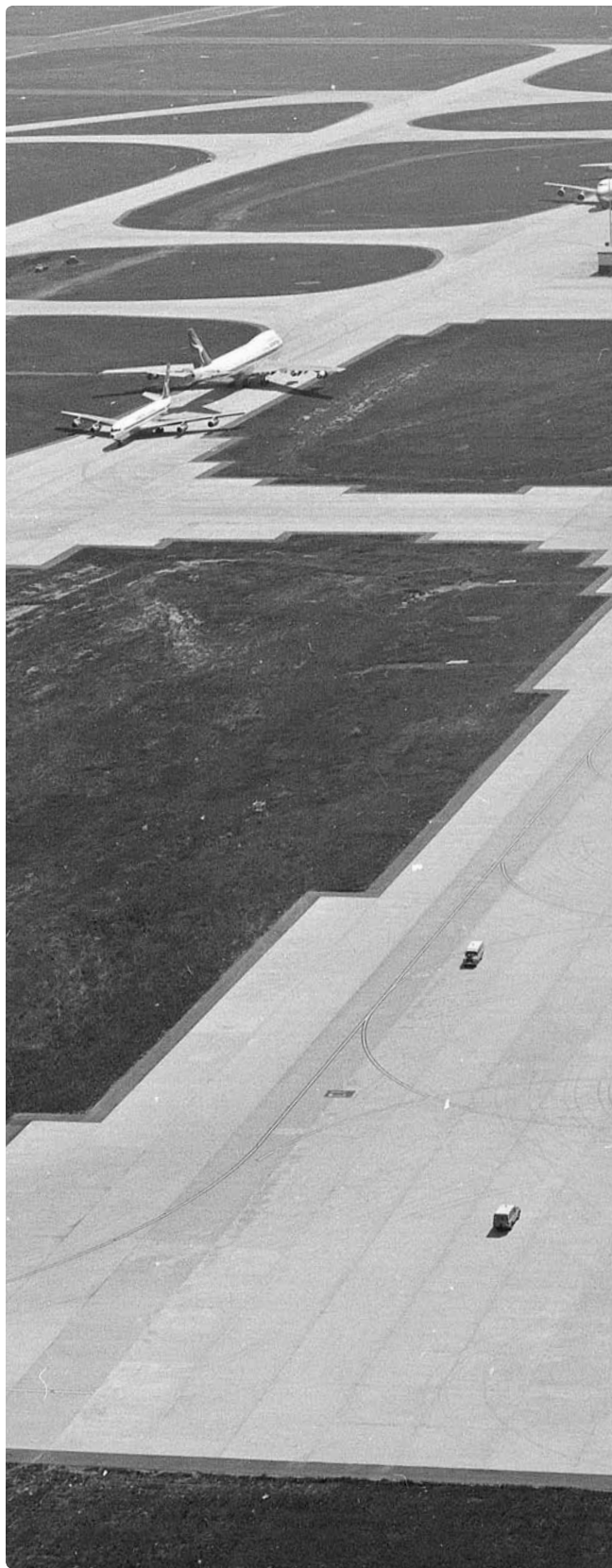
Limited parking space

Sydney-based Qantas, then a purely international airline, temporarily moved its flights terminating and originating in Australia to Melbourne, as did a number of other international airlines. Qantas and Air New Zealand jointly chartered special trains to bring passengers from Sydney to Melbourne, while the two domestic carriers, Trans-Australia Airlines (TAA) and Ansett Airlines, resorted to buses. Taxis and rented cars streamed out of Sydney towards Melbourne. On October 6 Melbourne Airport had its busiest day since opening three years before, with 67 international movements and total passenger numbers more than double the usual figures. Qantas alone operated 20 arrivals and 18 departures, with more than 800 passengers arriving by train from Sydney to catch flights at Tullamarine. The number of aircraft using Melbourne necessitated recourse to the unusual step of parking aircraft on taxiways.

By October 8 the DCA had approved a limited number of Melbourne—Sydney flights. These took advantage of a technique whereby flying higher than normal allowed the aircraft to maintain radio contact with Melbourne ATC until 100 miles (160km) out from Sydney, when they would come within range of an operational radio at Sydney. Ansett and TAA ran several passenger services each and Qantas was allowed to operate two services carrying crews.

Melbourne-based aviation historian Gordon Reid was overseas on his honeymoon when the strike hit. He recalls, "Our return flight to Australia was on Pan Am 747 N749PA, which was operating PA811 [Honolulu—Nandi—Sydney]; We operated Nandi to Melbourne owing to the strike. We arrived in Melbourne on October 9 and the strike ended on October 11".

After a stressful 30 days on strike, including the eight-day closure of Sydney Airport during October 3–11, the technicians agreed to return to work following an arbitration conference personally brokered by the Australian Council of Trade Unions' President Bob Hawke, a renowned "fixer" who later became the





It is perhaps hard to remember today just how big a leap in size the 747 was on its introduction into service in 1970, specially when compared to its forerunner, the 707. Here Qantas 747-238B VH-EBA, named City of Canberra, dwarfs 707-338C VH-EAE City of Swan Hill, while parked at Melbourne during the strike. The 707 still wears the airline's older "V-Jet" livery.



BELOW Another aerial view of Melbourne Airport during the 1973 strike, with the bigger airliners having to be parked wherever space can be found for them. Some of the parking spots for the smaller feederliners, mainly Fokker F-27s of Ansett, are empty, but would have been of little use to anything much bigger than a turboprop.





ABOVE Singapore Airlines 747 9V-SIB shares Melbourne's taxiway S with KLM's first 747, PH-BUA; the latter was hijacked a few weeks later by Palestinian terrorists on an Amsterdam—Tokyo flight, which ended without harm to aircraft or passengers after landing in Dubai. **BELOW** Air traffic controllers "pushing tin" at Melbourne in the 1970s.

Australian Prime Minister during 1983–91.

Sydney Airport was back to operating normally by 0930hr the following day; and 45min later the first international arrival, a BOAC Vickers VC10 from Nandi, touched down. Both TAA and Ansett quickly resumed normal services, but it took the international operators several days to get their schedules back to normal. A Qantas shuttle service returned to Sydney 200 staff that had been based in Melbourne during the strike.

Passengers on Qantas service QF533 (San Francisco—Sydney via Honolulu) were told on boarding that their destination would be Melbourne because of the strike, which was in fact concluded before the aircraft reached Australia. Sydney was not yet ready to accept international arrivals, however, and the aircraft overflowed Sydney and landed in Melbourne. As the aircraft awaited a parking gate, though, news arrived that Sydney was now open. Much to the chagrin of the passengers, especially those ultimately bound for Melbourne, the aircraft was turned around and took off for Sydney, to avoid the crew running out of duty time. "If we had waited to offload the Melbourne passengers, we would have greatly inconvenienced the majority, who were destined for Sydney", explained a Qantas spokesman.

The effects of the strike had not all been bad. A DCA spokesman told the newspapers that the unexpected emptying of Sydney Airport had



allowed more maintenance on the International Terminal to be completed in four weeks than had been possible in the previous six months.

Today Melbourne Airport averages nearly 600 movements a day, with almost 100 of those being international flights. Over a week at the height of the strike, some 23,500 passengers passed through Tullamarine; today an average of more than 82,000 passengers passes through the airport every day.






PHOTOGRAPHS BY THE AUTHOR

OFF THE BEATEN TRACK

*Ever turned a corner to find something unexpected? The Aviation Historian's intrepid aeronautical explorer **PETER DAVISON** investigates the stories behind the oddities that turn up in the most unusual places . . .*

Designed and built to a 1957 Soviet specification for a rugged 32-seat twin-engined transport capable of operating in the harshest of conditions from the most primitive of airstrips, the Antonov An-24 (Nato reporting name *Coke*) made its maiden flight in October 1959.

Production was undertaken at three sites: Kiev (985 examples) during 1959–79; Ulan-Ude (180) during 1965–70 and Irkutsk (197) during 1967–71. One novelty was the use of glue-welded joints rather than riveting in some critical areas. Bill Gunston said that the type “exemplifies Russian disregard for operating economy, and concentration on a tough vehicle for a tough environment . . . its Western counterparts can carry greater payloads further with about 10 per cent less power . . . but the An-24 met the need and has been the Soviet Union’s most successful export”. Indeed, it went on to see service in 38 countries around the world, and at one point was responsible for carrying a third of all Aeroflot passengers.

This Kiev-built 50-seat An-24B, c/n 9 73 056 01, has spent its entire career in Kazakhstan and, since 2002, has provided a talking point at a lakeside cafeteria in the new capital, Astana, which is rapidly becoming a modern central Asian crossroads of architectural wonders — and retired transport aircraft exhibits. 



TOP, ABOVE & BELOW Antonov An-24B serial CCCP-46334 on display in Astana, Kazakhstan, in May 2017. To get a bird’s-eye view of the much-travelled transport on Google Earth, enter 51.176617, 71.453199 into the Search box.





BAE SYSTEMS CP530

Coming up in future issues:

Proof Positive With the help of glorious photographs taken along the route, Colin Higgs details the record-setting world tour of the sole de Havilland Comet 3 in December 1955

"Hawker's TSR.2" Using declassified official documentation, Tony Buttler examines the political and technical aspects of the Hawker P.1129, a promising rival to the BAC TSR.2

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